

**ASUS<sup>®</sup>**  
**TS100-E4/PI2**  
Pedestal Server  
User Guide



E2791

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# Notices

## Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



---

**WARNING!** The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

---

## Canadian Department of Communications Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

This Class A digital apparatus complies with Canadian ICES-003.

# Safety information

## Electrical Safety

- Before installing or removing signal cables, ensure that the power cables for the system unit and all attached devices are unplugged.
- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing any additional devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your dealer.

## Operation Safety

- Any mechanical operation on this server must be conducted by certified or experienced engineers.
- Before operating the server, carefully read all the manuals included with the server package.
- Before using the server, make sure all cables are correctly connected and the power cables are not damaged. If any damage is detected, contact your dealer as soon as possible.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Place the server on a stable surface.



This product is equipped with a three-wire power cable and plug for the user's safety. Use the power cable with a properly grounded electrical outlet to avoid electrical shock.

### Lithium-Ion Battery Warning

**CAUTION!** Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

### CD-ROM Drive Safety Warning

**CLASS 1 LASER PRODUCT**

### Heavy System

**CAUTION!** This server system is heavy. Ask for assistance when moving or carrying the system.

# About this guide

## Audience

This user guide is intended for system integrators, and experienced users with at least basic knowledge of configuring a server.

## Contents

This guide contains the following parts:

### 1. Chapter 1: Product Introduction

This chapter describes the general features of the server, including sections on front panel and rear panel specifications.

### 2. Chapter 2: Hardware setup

This chapter lists the hardware setup procedures that you have to perform when installing or removing system components.

### 3. Chapter 3: Motherboard information

This chapter gives information about the motherboard that comes with the server. This chapter includes the motherboard layout, jumper settings, and connector locations.

### 4. Chapter 4: BIOS information

This chapter tells how to change system settings through the BIOS Setup menus and describes the BIOS parameters.

### 5. Chapter 5: RAID configuration

This chapter tells how to change system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

### 6. Chapter 6: Driver installation

This chapter provides instructions for installing the necessary drivers for different system components.

### 7. Appendix: Reference information

This appendix includes additional information that you may refer to when configuring the motherboard.

## Conventions

To make sure that you perform certain tasks properly, take note of the following symbols used throughout this manual.



**WARNING:** Information to prevent injury to yourself when trying to complete a task.



**CAUTION:** Information to prevent damage to the components when trying to complete a task.



**IMPORTANT:** Instructions that you **MUST** follow to complete a task.



**NOTE:** Tips and information to aid in completing a task.

## Typography

**Bold text**

Indicates a menu or an item to select.

*Italics*

Used to emphasize a word or a phrase.

<Key>

Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.

Example: <Enter> means that you must press the Enter or Return key.

<Key1>+<Key2>+<Key3>

If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).

Example: <Ctrl>+<Alt>+<Delete>

**Command**

Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets.

Example: At the DOS prompt, type the command line: **format A: /S**

## References

Refer to the following sources for additional information, and for product and software updates.

### 1. ASUS Server Web-based Management (ASWM) user guide

This manual tells how to set up and use the proprietary ASUS server management utility.

### 2. ASUS websites

The ASUS websites worldwide provide updated information for all ASUS hardware and software products. Refer to the ASUS contact information.

# Chapter 1

This chapter describes the general features of the barebone server, including sections on the front panel and rear panel specifications.



# Product introduction

## 1.1 System package contents

Check your ASUS TS100-E4/PI2 package with the items on the following table. The package contents vary for the following configurations:

Check your system package for the following items.

Chassis	ASUS T10 Non-rackable Tower chassis
Motherboard	ASUS P5M2-M/C_TS100-E4 motherboard
Components	250W Single power supply (110/230V Switching Selection) 1 x Standard 16x DVD-ROM or standard DVD-RW (Optional) Active CPU Cooler
Cables	AC power cable SATA cables SATA power cable IDE cable FDD cable System cables
Accessories	TS100-E4/PI2 user guide TS100-E4/PI2 support CD (includes ASWM*) CA Anti-virus software CD Bag of screws

\* ASUS System Web-based Management



Contact your dealer immediately if any of the items is damaged or missing.



## 1.2 System specifications

The ASUS TS100-E4/PI2 is a server system featuring the ASUS P5M2-M/C\_TS100-E4 motherboard. The server supports the Intel® Xeon® 3000/3200 or Pentium® D (D-stepping) series Processors, and includes the latest technologies through the chipsets embedded on the motherboard.

Chassis	T10 non-rackable Tower Chassis
Motherboard	ASUS P5M2-M/C_TS100-E4
Chipset	NorthBridge: Intel® Xeon 3000 chipset (Mukilteo-2) SouthBridge: Intel® ICH7R
CPU	LGA775 socket for Intel® Xeon® 3000/3200 or Pentium® D (D-stepping) series processors Supports Intel® Enhanced Memory 64 Technology (EM64T) Supports Enhanced Intel SpeedStep® Technology (EIST)
Memory	Dual-channel memory architecture 4 x 240-pin DIMM sockets support unbuffered ECC/non-ECC DDR2-533/667 memory modules Supports up to 8 GB system memory
LAN	Single embedded Broadcom BCM5721 Gigabit LAN controllers that comply with PCI Express 1.0a specifications
VGA	XGI Volari® PCI-based VGA controller with 32 MB memory
Storage	Intel® ICH7R Southbridge supports: - 2 x SATAII 300MB/s drives with RAID functionality using the Intel Matrix Storage Manager (IMSM)(RAID 0, RAID 1), or the LSI Logic Embedded SATA RAID controller (RAID 0, RAID 1)
Expansion slots	1 x PCIe x8 Slot (x4 Link) (PCI E1 slot) 1 x PCIe x8 Slot (x8 Link) (PCI E2 slot) 2 x PCI 32bit/33MHz 5V Slots 1 x SO-DIMM socket for ASUS Server Management Board
Front panel	4 x 5.25" Space for max of 2* IDE device (Option: DVD-ROM or DVD-RW) 2 x USB 2.0 ports 1 x FDD Power switch Reset switch LEDs: Power, HDD access
Rear panel	1 x PS/2 keyboard port (purple) 1 x PS/2 mouse port (green) 2 x USB 2.0 ports 1 x Parallel port 1 x Serial port (COM1) 1 x VGA port 1 x LAN (RJ-45) port
Management	ASUS Server Web-based Management (ASWM 2.0)
Hardware support (optional)	SM-Bus, ASMB3-SOL support IPMI 2.0 Over LAN management card

(continued on the next page)

Hardware monitors	Voltage, temperature, and fan speed monitoring Automatic System Restart (ASR) feature
Power supply	250W single power supply, 100V~130Vac/200~260Vac by switching setting; 50Hz~60Hz, 24pin + 4pin power connector
Dimensions	192 mm (W) x 490 mm (D) x 426 mm (h)
Net Weight	13.5 kg




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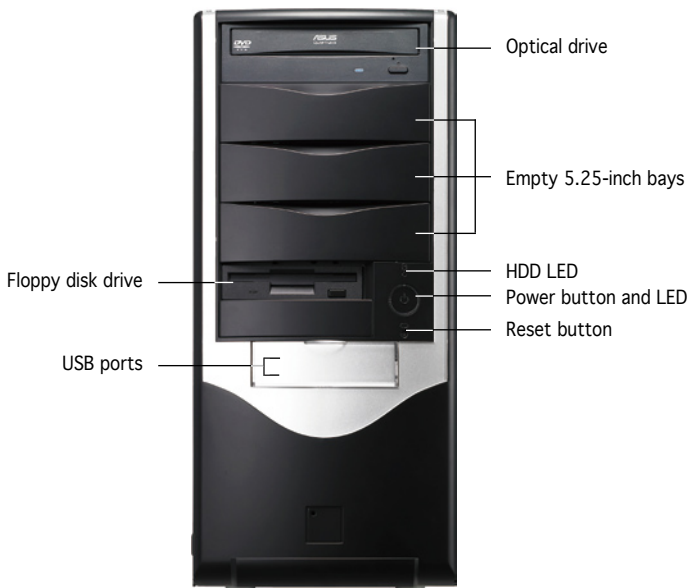
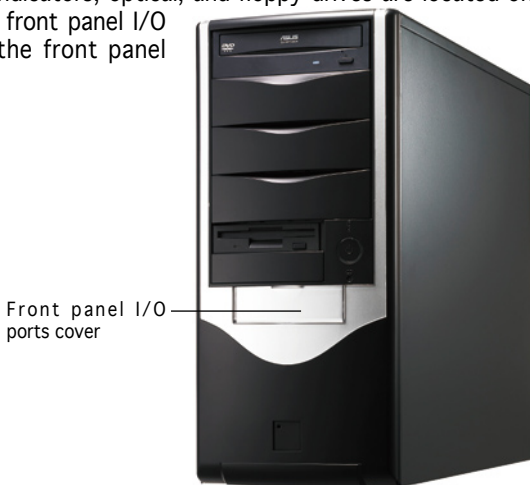
Refer to "Chapter 3 Motherboard information" for details on the internal connectors.

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## 1.3 Front panel features

The TS100-E4/PI2 chassis displays a black stylish front panel.

The power button, LED indicators, optical, and floppy drives are located on the front panel. Flip the front panel I/O ports cover to access the front panel USB ports.



# 1.4 LED information

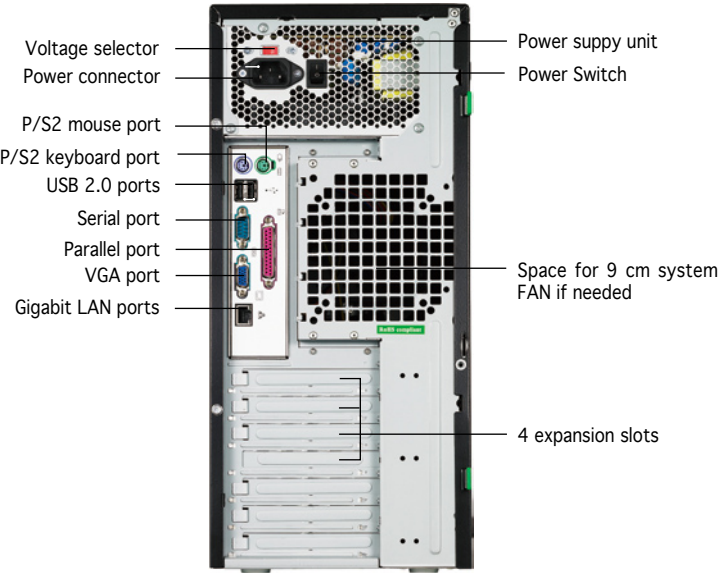
The TS100-E4/PI2 comes with two LED indicators. Refer to the picture for the LED location and the table below for LED description.



LED	Icon	Display	Description
Drive Activity LED		Blinking	Read/write data into the HDD
Power LED		ON Blinking	System power ON Suspend mode

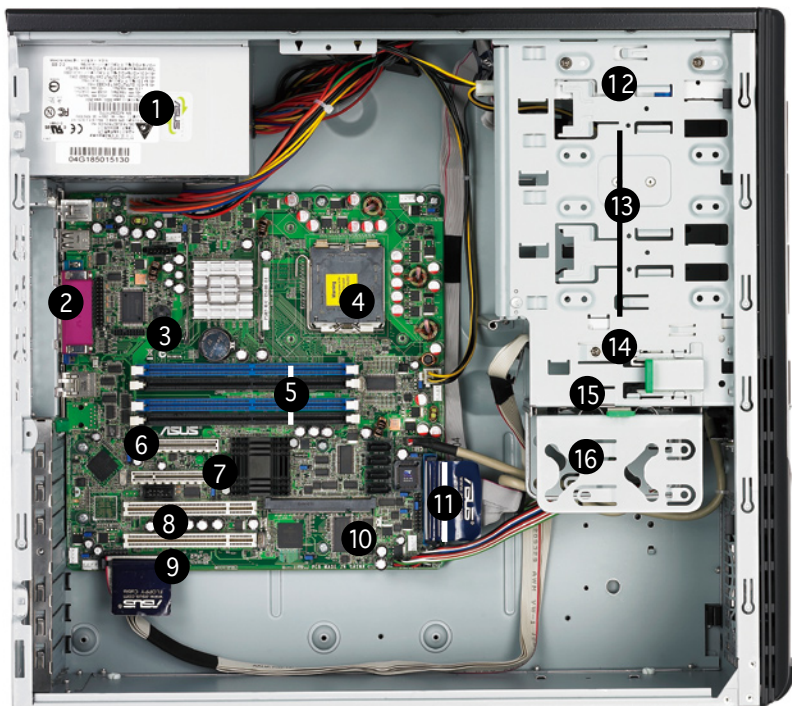
# 1.5 Rear panel features

The rear panel includes a slot for the motherboard rear I/O ports, four full-length expansion slots, chassis cover locks, a vent for the system fan, and the power supply unit.



## 1.6 Internal features

The TS100-E4/PI2 chassis includes the basic components as shown.



- |                                  |                                       |
|----------------------------------|---------------------------------------|
| 1. Power supply                  | 9. Floppy disk drive connector        |
| 2. Space for 9 cm system FAN     | 10. IDE connector                     |
| 3. ASUS P5M2-M/C_TS100-E4        | 11. Serial ATA connectors             |
| 4. CPU socket and CPU Cooler     | 12. Optical drive (Standard/Optional) |
| 5. DDR2 DIMM sockets             | 13. Empty 5.25-inch drive bays        |
| 6. PCI Express x8 slot (x4 Link) | 14. Floppy disk drive                 |
| 7. PCI Express x8 slot (x8 Link) | 15. HDD bay                           |
| 8. 2 x PCI slots                 | 16. Detachable HDD cage               |



The hard disk drives are purchased separately.



# Chapter 2

This chapter lists the hardware setup procedures that you have to perform when installing or removing system components.

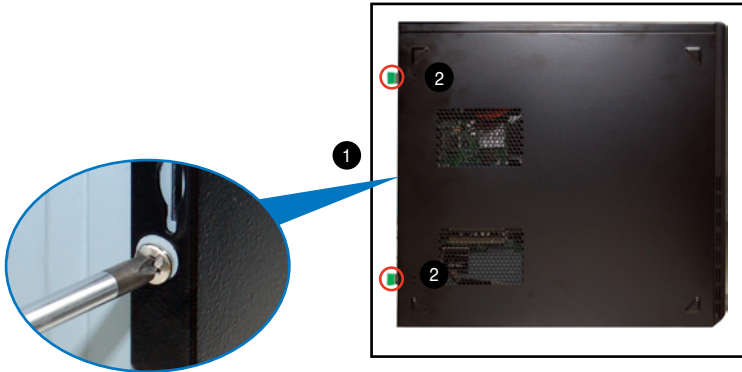


# Hardware setup

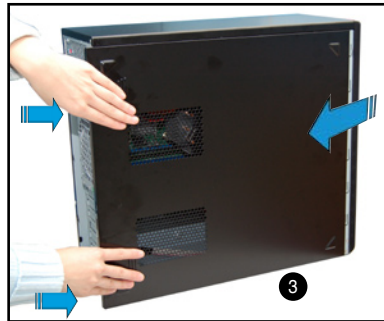
## 2.1 Removing the side cover

To remove the side cover:

1. Use a Philips screwdriver to remove the screw on the side cover.
2. Locate the two side cover locks.



3. Press the side cover locks outward, then pull the side cover toward the rear panel for about one-half inch.



3. Move the side cover to the direction of the arrow.
4. Lift the side cover, then set aside.





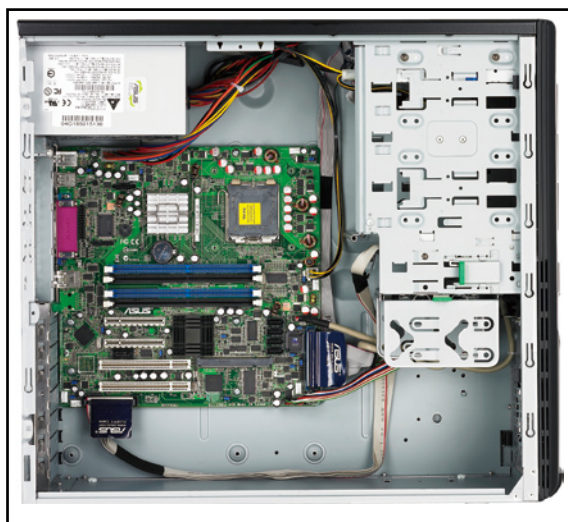


- Make sure that you unplug the power cord before removing the side cover.
- Take extra care when removing the side cover. Keep your fingers from components inside the chassis that can cause injury, such as the CPU fan, rear fan, and other sharp-edged parts.

## Viewing the internal structure

Without the side cover, the internal structure and installed components of the barebone server appear as shown in the following picture.

Perform the procedures in the succeeding sections to install the CPU, system memory, disk drives, and expansion cards.



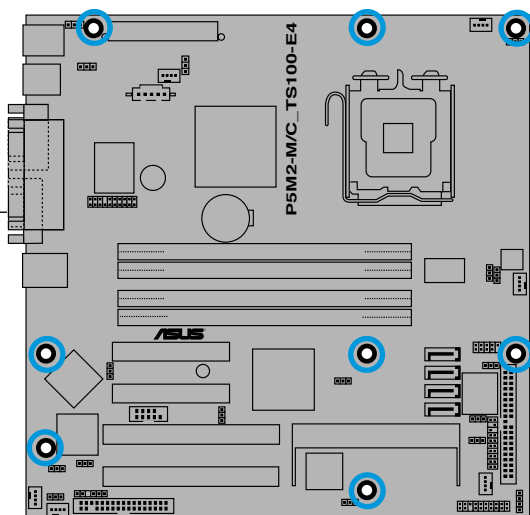
## 2.2 Motherboard information

Place eight (8) screws into the holes indicated by circles to secure the motherboard to the chassis.



Refer to "Chapter 3 Motherboard Information" for detailed Information.

Place this side towards  
the rear of the chassis



Make sure to unplug the power cord before installing or removing the motherboard. Failure to do so can cause you physical injury and damage motherboard components.

## 2.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA775 socket designed for the Intel® Xeon® 3000/3200 or Pentium D series processors in the 775-land package.

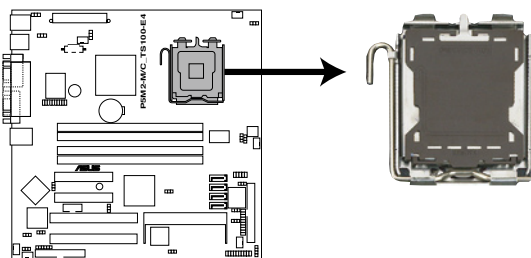


- Upon purchase of the motherboard, make sure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS shoulders the repair cost only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA775 socket.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

### 2.3.1 Installing the CPU

To install a CPU:

1. Locate the CPU socket on the motherboard.

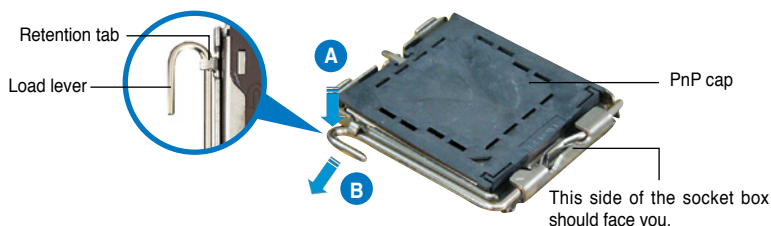


**P5M2-M/C\_TS100-E4 CPU Socket 775**



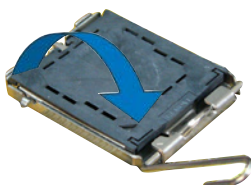
Before installing the CPU, make sure that the cam box is facing towards you and the load lever is on your left.

2. Press the load lever with your thumb (A), then move it to the left (B) until it is released from the retention tab.

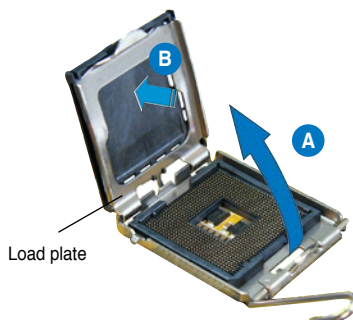


To prevent damage to the socket pins, do not remove the PnP cap unless you are installing a CPU.

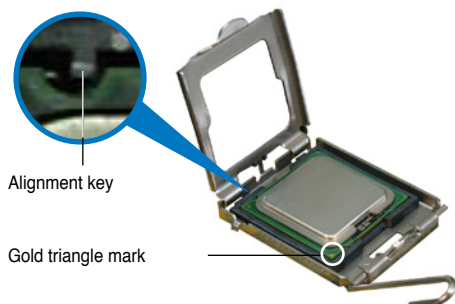
3. Lift the load lever in the direction of the arrow to a 135° angle.



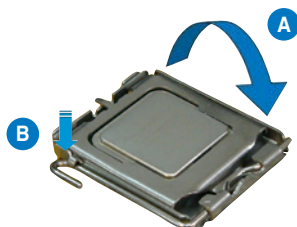
4. Lift the load plate with your thumb and forefinger to a 100° angle (A), then push the PnP cap from the load plate window to remove (B).



5. Position the CPU over the socket, making sure that the gold triangle is on the bottom-left corner of the socket. The socket alignment key should fit into the CPU notch.



6. Close the load plate (A), then push the load lever (B) until it snaps into the retention tab.



The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU!

## 2.3.2 Installing the CPU heatsink

The Intel® Xeon 3200/3000 or Pentium D processors require an Intel certified or ASUS qualified heatsink to ensure optimum thermal condition and performance.

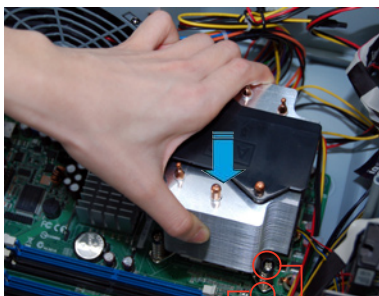
When you buy a boxed Intel CPU, the package includes the heatsink, fan, retention brackets, screws, thermal grease, installation manual, and other items that are necessary for CPU installation.



- Make sure that you have applied the thermal grease to the top of the CPU before installing the heatsink and fan.
- Refer to the installation manual that came with the CPU package for details on heatsink/fan assembly and installation.
- For installation instruction of bundled ASUS qualified CPU heatsink and fan assembly, refer to section 3.2.

To install the CPU heatsink and fan:

1. Place the heatsink on top of the installed CPU, making sure that the CPU fan screws match the holes on the motherboard.

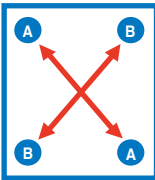


CPU fan screw hole CPU fan screw

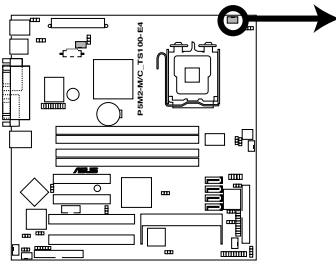


- Orient the heatsink and fan assembly such that the CPU fan cable is closest to the CPU\_FAN1 connector.
- An X-pad™ comes pre-installed under the motherboard.

2. Fasten the screws in a diagonal sequence to secure the heatsink and fan assembly in place.

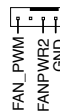


3. Connect the CPU fan cable to the connectors on the motherboard labeled CPU\_FAN1.



**P5M2-M/C\_TS100-E4 CPU Fan connector**

**CPU\_FAN1**



Do not forget to connect the CPU fan connector to CPU\_FAN1 !  
Hardware monitoring errors can occur if you fail to plug this connector.

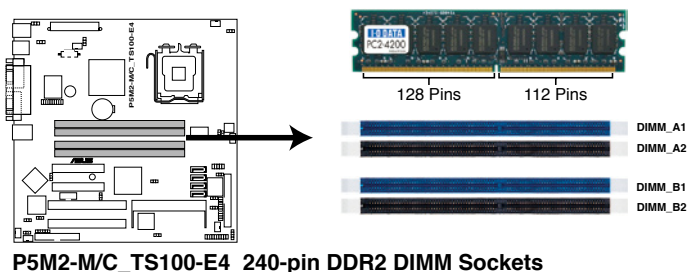
## 2.4 System memory

### 2.4.1 Overview

The motherboard comes with four Double Data Rate 2 (DDR2) Dual Inline Memory Modules (DIMM) sockets.

A DDR2 module has the same physical dimensions as a DDR DIMM but has a 240-pin footprint compared to the 184-pin DDR DIMM. DDR2 DIMMs are notched differently to prevent installation on a DDR DIMM socket.

The figure illustrates the location of the DDR2 DIMM sockets:



### 2.4.2 Memory configurations

You may install 512 MB, 1 GB, and 2 GB unbuffered ECC or non-ECC DDR2-533/667 DIMMs into the DIMM sockets.



- Always install DIMMs with the same CAS latency. For optimum compatibility, we recommend that you obtain memory modules from the same vendor. Refer to the DDR2 Qualified Vendors List on the ASUS web site.
- When installing one or two DIMMs, install the DIMM(s) to the blue slots (DIMM\_A1/DIMM\_B1).
- Three DDR2 DIMMs installed into any three memory sockets will function in single-channel mode.

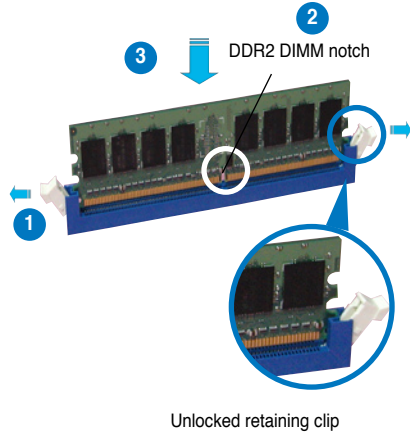
## 2.4.3 Installing a DIMM



Unplug the power supply before adding or removing DIMMs or other system components. Failure to do so can cause severe damage to both the motherboard and the components.

To install a DIMM:

1. Unlock a DIMM socket by pressing the retaining clips outward.
2. Align a DIMM on the socket such that the notch on the DIMM matches the break on the socket.
3. Firmly insert the DIMM into the socket until the retaining clips snap back in place and the DIMM is properly seated.



- A DDR2 DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket to avoid damaging the DIMM.
- The DDR2 DIMM sockets do not support DDR DIMMs. DO NOT install DDR DIMMs to the DDR2 DIMM sockets.

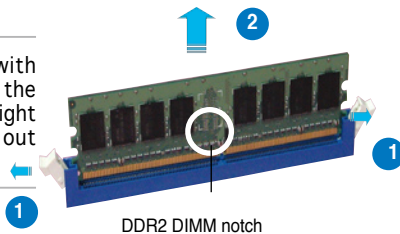
## 2.4.4 Removing a DIMM

Follow these steps to remove a DIMM.

1. Simultaneously press the retaining clips outward to unlock the DIMM.



Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it flips out with extra force.



2. Remove the DIMM from the socket.



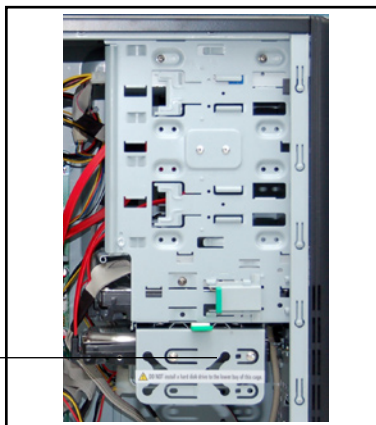
## 2.5 Installing a hard disk drive

The server system supports one Serial ATA hard disk drive through a detachable hard disk drive cage.



You may purchase a second hard disk drive cage to install an additional HDD. Refer to the next chapter for details.

Hard disk drive cage



### Hard disk drive installation

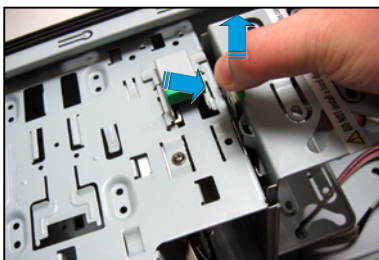
The detachable hard disk drive cage accommodates one Serial ATA hard disk drive.

To install the first Serial ATA hard disk drive:

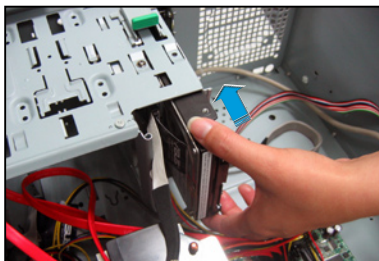


Configure your hard disk drive as Master/Slave device before installing it to the drive cage. Refer to the HDD documentation on how to set the drive as a Master/Slave device.

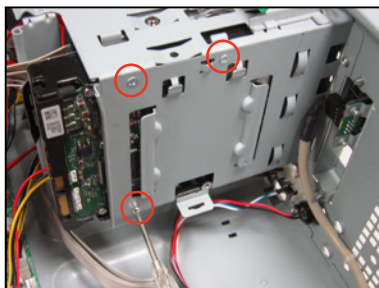
1. First remove side cover.
2. Then, press the HDD cage lock while pulling the cage out from the chassis. Place the HDD cage in a flat surface.



3. Install the SATA HDD.



- Secure the SATA HDD with three screws as show.

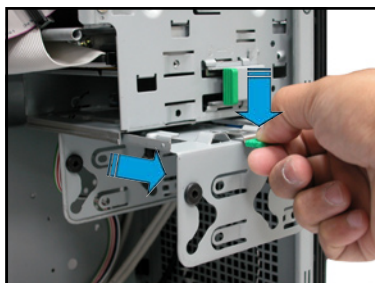


- Connect the SATA signal and power cables.



To install the second Serial ATA hard disk drive:

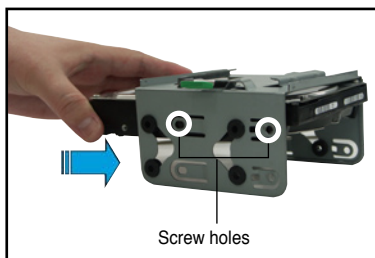
- Press the HDD cage lock while pulling the cage out from the chassis. Place the HDD cage in a flat surface.



- Insert an HDD to the upper bay of the cage. Make sure that the HDD screw holes are aligned with the HDD cage screw holes.



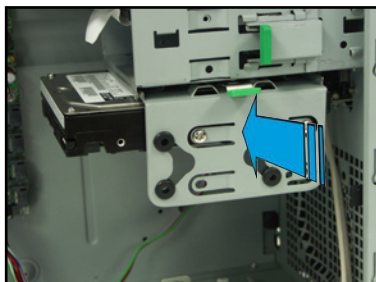
DO NOT install a hard disk drive to the lower bay of the cage.



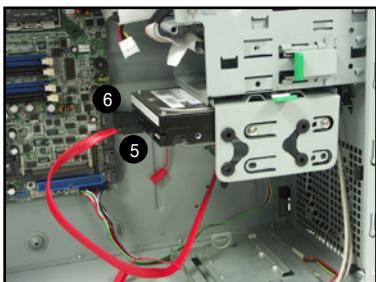
3. Secure the HDD to the cage with two screws on both sides of the cage.



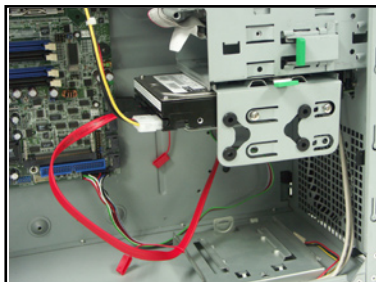
4. Reinstall the HDD cage to the chassis. Align the HDD cage and bay assembly rails, then carefully push the HDD cage until it is flushed to the chassis.



5. Connect one end of the supplied 7-pin SATA cable to the SATA connector at the back of the drive.
6. Connect the other end to a SATA connector on the motherboard. See page 3-6 for the location of the SATA connectors.

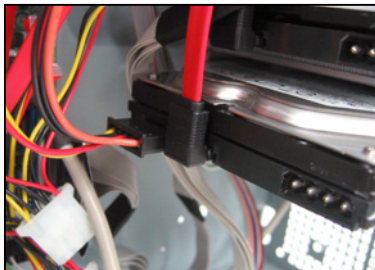


7. Connect a 4-pin power plug from the power supply unit to the power connector at the back of the drive.

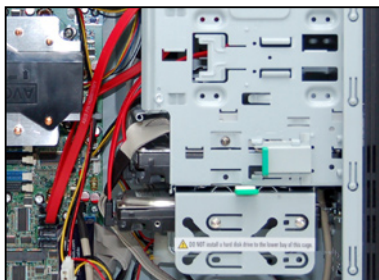


OR

Connect the 15-pin Serial ATA power plug to the Serial ATA power connector at the back of the drive.



8. The first and second SATA HDD install finished as show.



---

Use either the SATA power connector OR the legacy 4-pin power connector. DO NOT use both to prevent damage to components and to keep the system from becoming unstable.

---

## 2.6 Installing 5.25-inch drives

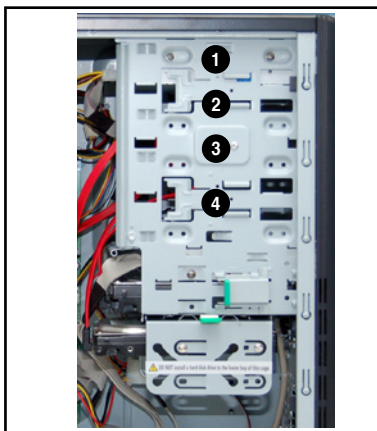


Make sure to unplug the power cable before installing or removing any system components. Failure to do so may cause severe damage to the motherboard and other system components!

The system comes with four 5.25-inch drive bays located on the upper front part of the chassis. An optical drive that comes standard/optional with the system package occupies the uppermost bay (labeled 1). The lower bays (labeled 2, 3, and 4) are available for additional 5.25-inch optical, zip, or floppy disk drives.



You must remove the front panel cover before installing a 5.25-inch drive(s).

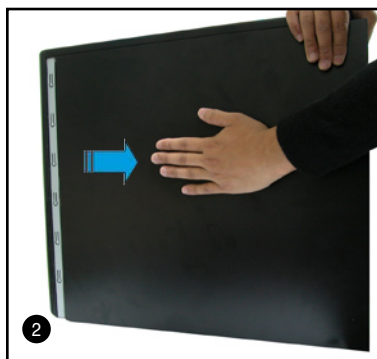


### 2.6.1 Removing the front panel cover

To remove the front panel cover:

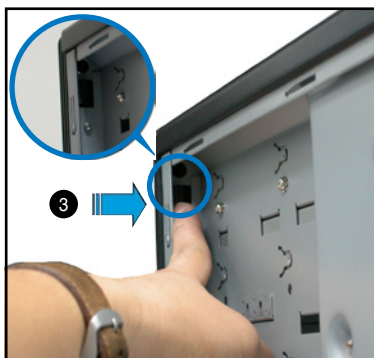


1. Locate and remove two screws that secure the left side cover to the chassis. Keep the screw for later use.

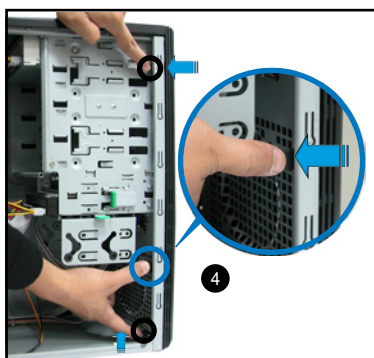


2. Slightly pull the cover toward the direction of the rear panel until it disengages from the chassis. Set the cover aside.

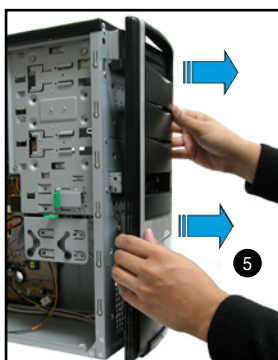
3. Press the front panel cover hook inward until it detaches from the chassis hole.



4. On the other side of the system, locate three front panel cover hooks. Press the hooks inward until the front panel cover detaches from the chassis.



5. Carefully remove the front panel cover, then set aside.

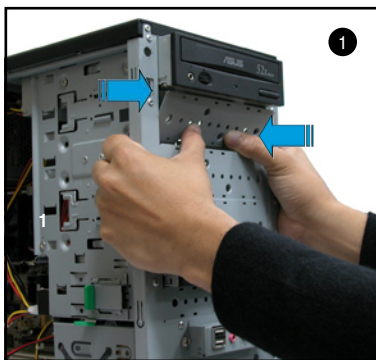


## 2.6.2 Installing additional optical drive(s)

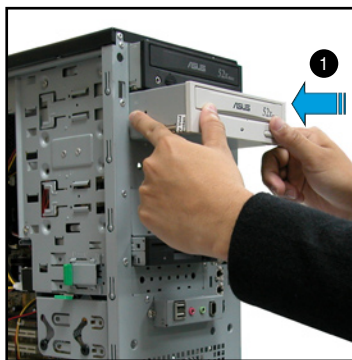


Configure your optical drive as Master/Slave device before installing it to the drive bay. Refer to the optical drive documentation for details.

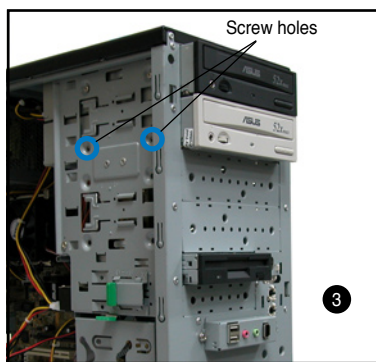
To install an additional optical drive(s):



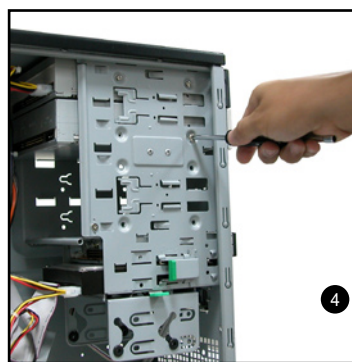
1. Select the drive bay you intend to use. Push the knock down metal cover in and out of the chassis until it is removed.



2. Carefully insert the drive to the bay, then push it inward until it is flushed to the chassis front panel.

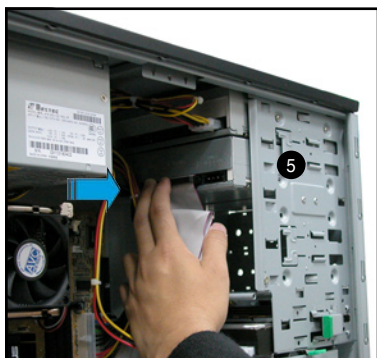


3. Align the optical drive and bay screw holes.

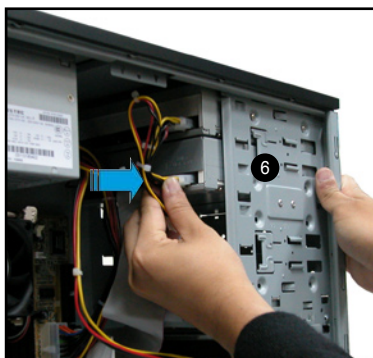


4. Secure the drive with two screws on both sides of the bay.

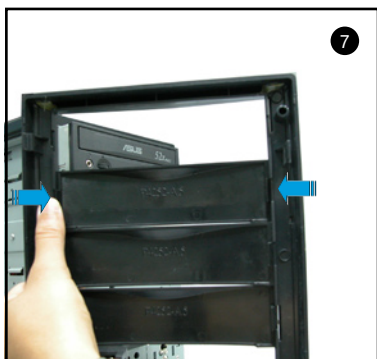




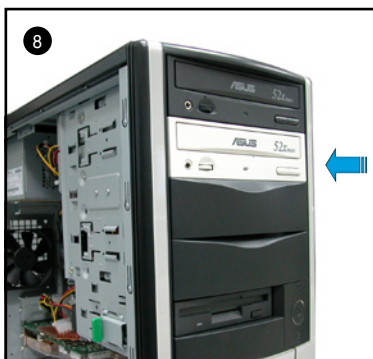
5. Connect a 40-pin IDE cable (from the first optical drive) to the IDE connector on the drive.



6. Connect a 4-pin power plug from the power supply unit to the drive power connector.



7. Remove the front panel bay cover opposite the drive bay you used by pressing the hooks inward.  
Follow the same procedures when installing additional optical drives.



8. Reinstall the front panel and side covers when done.



## 2.7 Installing expansion cards

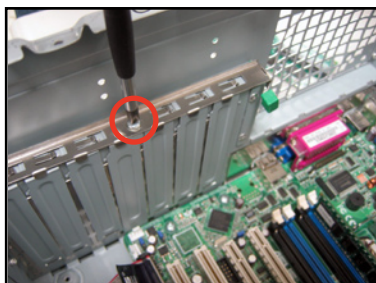
The system comes with two PCI slots, one PCI Express x8 (x8 link) slot, and one PCI Express x1 (x4 link) slot.



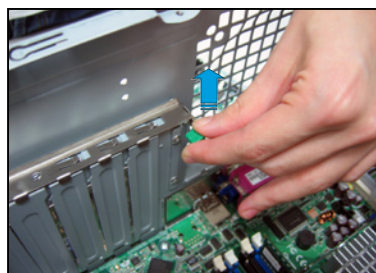
Make sure to unplug the power supply before installing or removing an expansion card(s). Failure to do so may cause severe damage to both the motherboard and the components.

To install an expansion card:

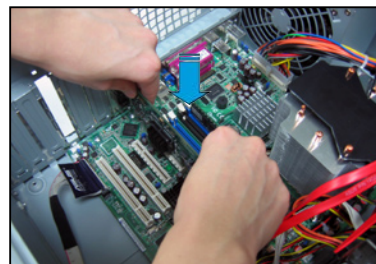
1. Before installing the expansion card, read the documentation that came with it and make the necessary hardware settings for the card.
2. Lay the system on its side on a flat, stable surface.
3. Release the screw as show.



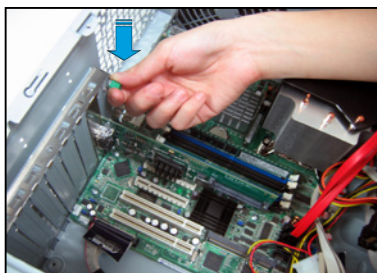
4. Then remove the hook metal bracket under all slots of metal bracket.
5. Then remove the metal bracket opposite the slot that you intend to use. Keep the metal bracket screw for later use.



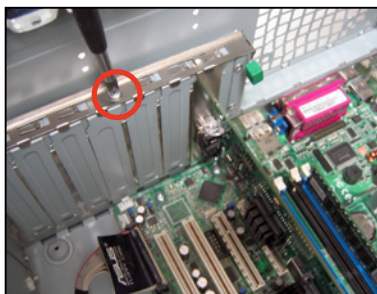
6. Align the card connector with the slot, then press firmly until the card is completely seated on the slot.



7. Then install the hook metal bracket under all slots of metal bracket.



8. Finally, use the screwdriver secure the screw that you removed earlier.



## 2.8 Removing components

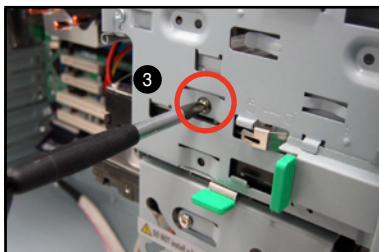
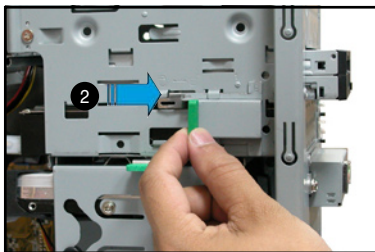
You may need to remove previously installed system components when installing or removing other system components, or when replacing a defective component. This section tells how to remove the following components:

1. Floppy disk drive (FDD)
2. System fan (Optional)

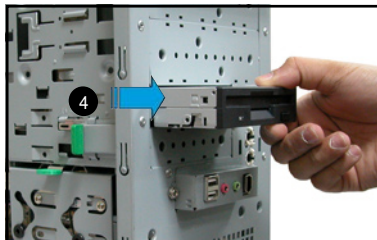
### 2.8.1 Removing the floppy disk drive

To remove the FDD:

1. Disconnect the FDD power plug and signal cable.

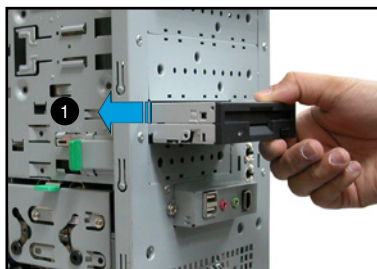


2. Unlock the FDD bay by moving the drive bay lock toward the direction of the front panel.
3. Use the screwdriver to release the screw.
4. Carefully pull the FDD from the chassis. Set the FDD aside.

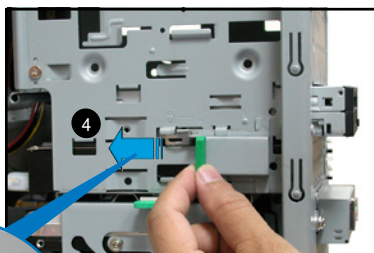
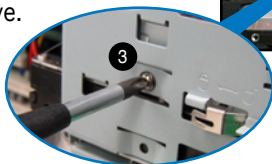


To install a floppy disk drive:

1. Insert the drive to the bay until it is flushed to the chassis front panel.
2. Align the FDD screw hole with the drive bay lock pin.



3. Use the screwdriver secure the screw that you removed earlier.
4. Move the drive bay lock toward the rear panel to secure the lock.
5. Attach the FDD power and signal cables to the connectors at the back of the drive.



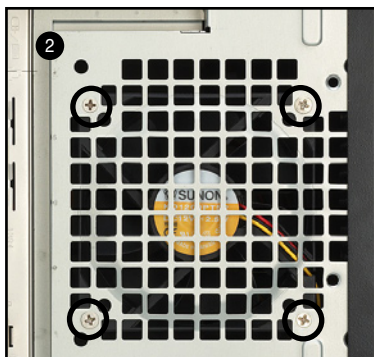
## 2.8.2 Removing/Add the chassis fan (Optional)

To remove the chassis fan:

1. Disconnect the chassis fan cable from the REAR\_FAN1 connector on the motherboard.
2. Locate and remove four chassis fan screws at the rear panel. Keep the screws for later use.



Hold the chassis fan with one hand while removing the chassis fan screws.



3. Remove the chassis fan, then set aside.



The chassis fan is purchased separately.

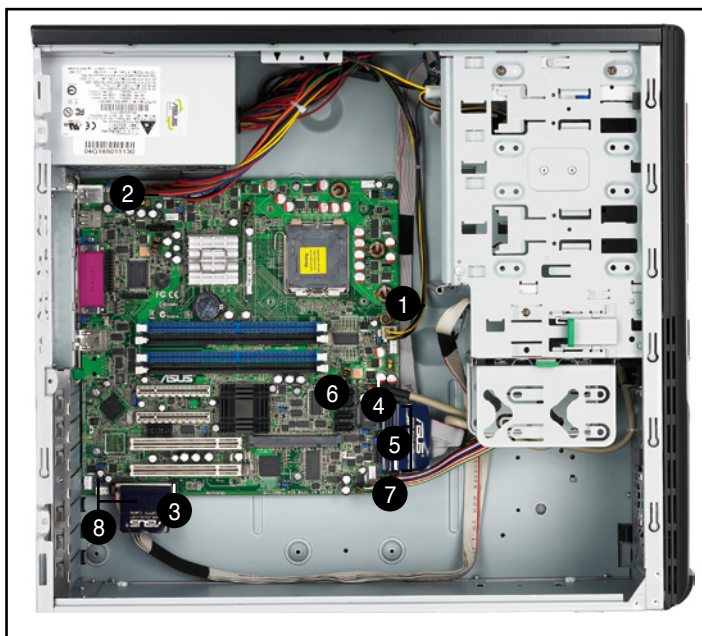


## 2.9 Connecting cables

The TS100-E4/PI2 chassis includes the power and signal cables that you need to connect to the motherboard, storage drives, and other devices that you intend to install.



Most of the cables for the chassis kit are already connected upon shipment. When installing system devices and connecting cables, make sure that all cables are routed properly for better system stability and performance. Refer to the picture below when arranging cables.



### Standard cables connected to the motherboard

- |                                   |                             |
|-----------------------------------|-----------------------------|
| 1. 4-pin ATX 12V power plug       | 5. IDE signal cable         |
| 2. 24-pin ATX power plug          | 6. Serial ATA signal cables |
| 3. Floppy disk drive ribbon cable | 7. System panel cable       |
| 4. Front panel USB 2.0 cable      | 8. System fan cables        |

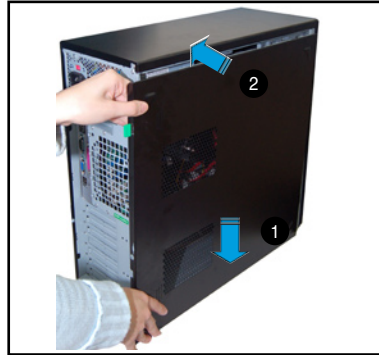


See “Chapter 3: Motherboard information” for detailed information on motherboard connectors.

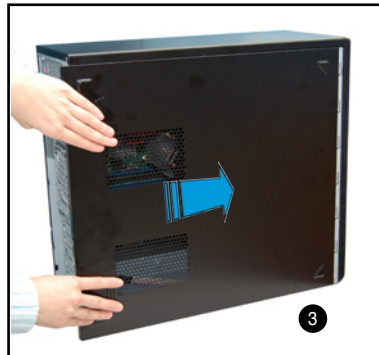
## 2.10 Replacing the side cover

After installing all components and re-connecting cables, replace the side cover by following these instructions.

1. Match the side cover hooks to the chassis rail on the side of the chassis.
2. Fit the side cover the cover toward the chassis until it fits.



3. Slide the cover toward the front until it snaps in place.



# Chapter 3

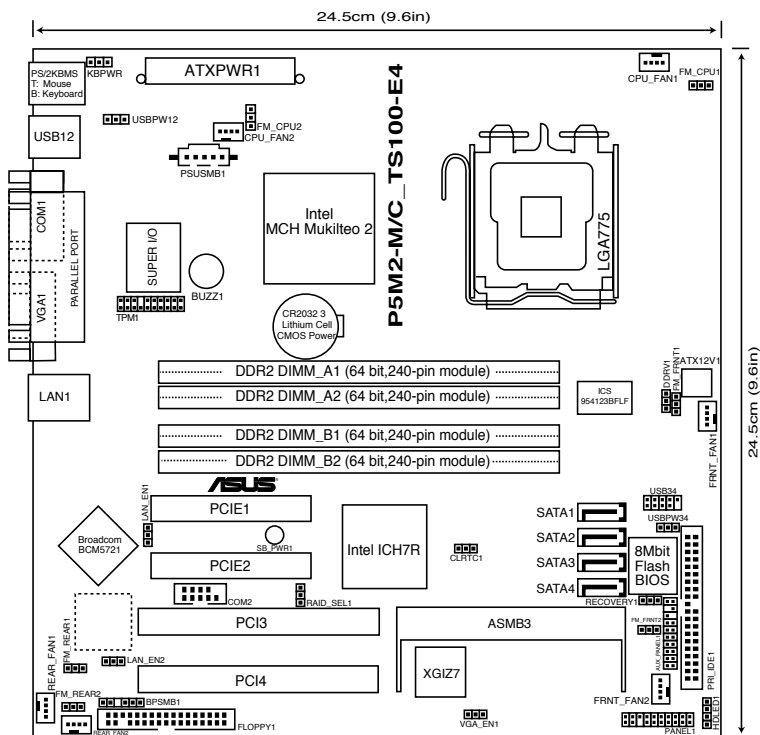
This chapter gives information about the motherboard that comes with the server. This chapter includes the motherboard layout, jumper settings, and connector locations.



# Motherboard Info

# 3.1 Motherboard overview

## P5M2-M/C\_TS100-E4





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## 3.2 Jumpers

### 1. Clear RTC RAM (CLRRTC1)

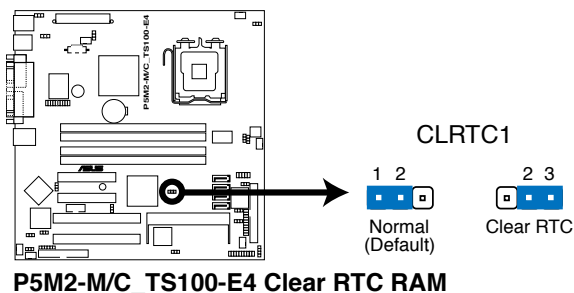
This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.

To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.
2. Remove the onboard battery.
3. Move the jumper cap from pins 1-2 (default) to pins 2-3. Keep the cap on pins 2-3 for about 5~10 seconds, then move the cap back to pins 1-2.
4. Re-install the battery.
5. Plug the power cord and turn ON the computer.
6. Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.

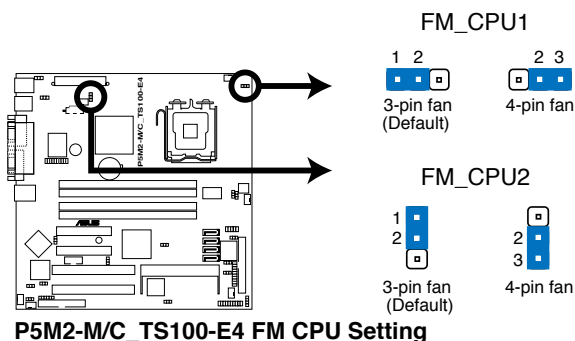


Except when clearing the RTC RAM, never remove the cap on CLRRTC jumper default position. Removing the cap will cause system boot failure!



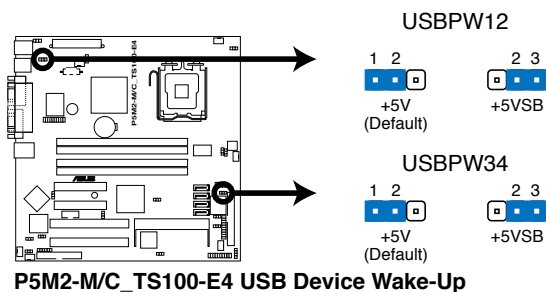
## 2. CPU fan pin selection (3-pin FM\_CPU1, FM\_CPU2)

These jumpers allow you to connect either a 3-pin or a 4-pin fan cable plug to the CPU fan connectors (CPU\_FAN1, CPU\_FAN2). Set these jumpers to pins 1-2 if you are using a 3-pin fan cable plug, or to pins 2-3 if you are using a 4-pin plug.



## 3. USB device wake-up (3-pin USBPW12, USBPW34)

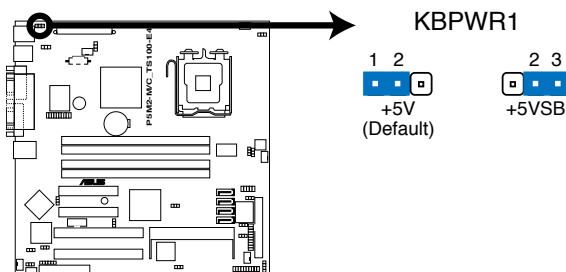
Set these jumpers to +5V to wake up the computer from S1 sleep mode (CPU stopped, DRAM refreshed, system running in low power mode) using the connected USB devices. Set to +5VSB to wake up from S4 sleep mode (no power to CPU, DRAM in slow refresh, power supply in reduced power mode).



- The USB device wake-up feature requires a power supply that can provide 500mA on the +5VSB lead for each USB port; otherwise, the system would not power up.
- If you are using Windows 2000, you need to install Service Pack 4 to wake up the system from S4 sleep mode.
- The total current consumed must NOT exceed the power supply capability (+5VSB) whether under normal condition or in sleep mode.

#### 4. Keyboard/Mouse power (3-pin KBPWR1)

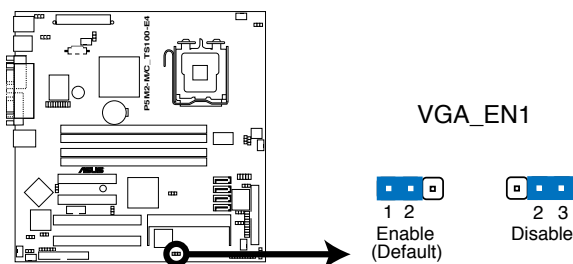
This jumper allows you to enable or disable the keyboard/mouse wake-up feature. Set this jumper to pins 2-3 (+5VSB) to wake up the computer when you press a key on the keyboard (the default is the Space Bar) or use the mouse. This feature requires an ATX power supply that can supply at least 1A on the +5VSB lead, and a corresponding setting in the BIOS.



**P5M2-M/C\_TS100-E4 Keyboard Power Setting**

#### 5. VGA controller setting (3-pin VGA\_EN1)

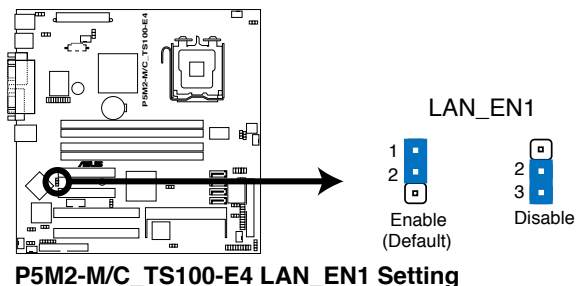
These jumpers allow you to enable or disable the onboard XGI Volari Z7® PCI VGA controller. Set to pins 1-2 to activate the VGA feature.



**P5M2-M/C\_TS100-E4 VGA Setting**

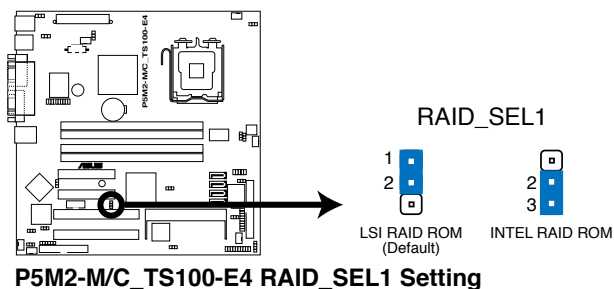
## 6. Gigabit LAN controller setting [3-pin LAN\_EN1)

These jumpers allow you to enable or disable the onboard Broadcom® BCM5721 Gigabit LAN1 controller. Set to pins 1-2 to activate the Gigabit LAN controller.



## 7. RAID controller selection (3-pin RAID\_SEL1)

This jumper allows you to select the RAID configuration utility to use when you create disk arrays. Place the jumper caps over pins 1-2 if you want to use the LSI Logic Embedded SATA RAID Setup Utility (default); otherwise, place the jumper caps to pins 2-3 to use the Intel® Matrix Storage Manager.

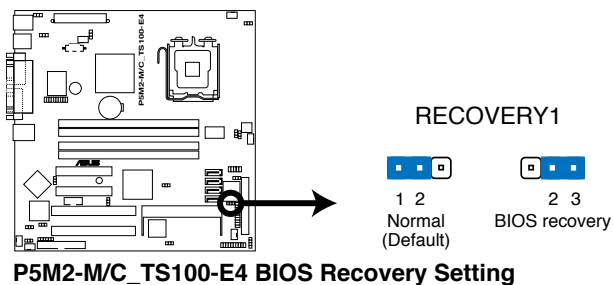


8. Force BIOS recovery setting (3-pin RECOVERY1)

This jumper allows you to quickly update or recover the BIOS when it gets corrupted.

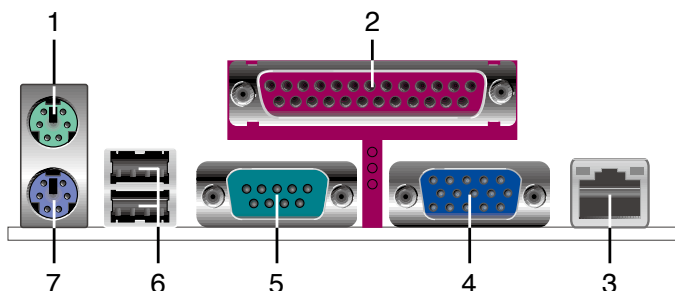
To update the BIOS:

1. Prepare a floppy disk that contains the latest BIOS for the motherboard (xxxx-xxx.ROM) and the AFUDOS.EXE utility.
2. Set the jumper to pins 2-3.
3. Insert the floppy disk then turn on the system to update the BIOS.
4. Shut down the system.
5. Set the jumper back to pins 1-2.
6. Turn on the system.



## 3.3 Connectors

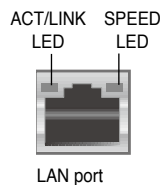
### 3.3.1 Rear panel connectors



1. **PS/2 mouse port (green).** This port is for a PS/2 mouse.
2. **Parallel port.** This 25-pin port connects a parallel printer, a scanner, or other devices.
3. **Gigabit LAN1 (RJ-45) port.** This ports allow Gigabit connection to a Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indications.
4. **VGA port.** This port is for a VGA monitor or other VGA-compatible devices.
5. **Serial (COM1) port.** This 9-pin communication port is for pointing devices or other serial devices.
6. **USB 2.0 ports 1 and 2.** These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 2.0 devices.
7. **PS/2 keyboard port (purple).** This port is for a PS/2 keyboard.

#### LAN port LED indications

ACT/LINK LED		SPEED LED	
Status	Description	Status	Description
OFF	No link	OFF	10 Mbps connection
GREEN	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection





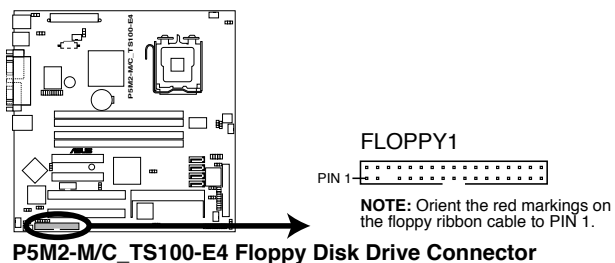
### 3.3.2 Internal connectors

#### 1. Floppy disk drive connector (34-1 pin FLOPPY1)

This connector is for the provided Floppy Disk Drive (FDD) signal cable. Insert one end of the cable to this connector, then connect the other end to the signal connector at the back of the floppy disk drive.



Pin 5 on the connector is removed to prevent incorrect cable connection when using a FDD cable with a covered Pin 5.

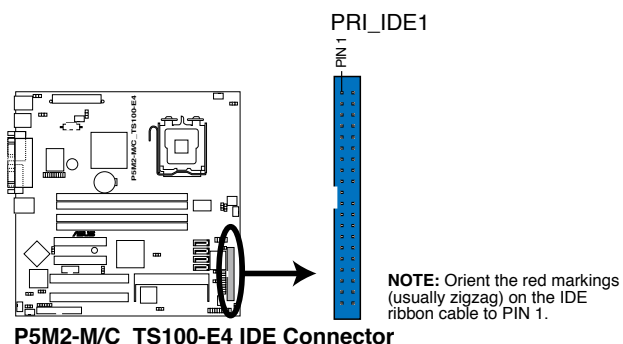


## 2. ICH7R primary IDE connector (40-pin PRI\_IDE1)

This connector is for an Ultra DMA 100/66 signal cable. The Ultra DMA 100/66 signal cable has three connectors: a blue connector for the primary IDE connector on the motherboard, a black connector for an Ultra DMA 100/66 IDE slave device (optical drive/hard disk drive), and a gray connector for an Ultra DMA 100/66 IDE master device (hard disk drive). If you install two hard disk drives, you must configure the second drive as a slave device by setting its jumper accordingly. Refer to the hard disk documentation for the jumper settings.



- Pin 20 on the IDE connector is removed to match the covered hole on the Ultra DMA cable connector. This prevents incorrect insertion when you connect the IDE cable.
- Use the 80-conductor IDE cable for Ultra DMA 100/66 IDE devices.



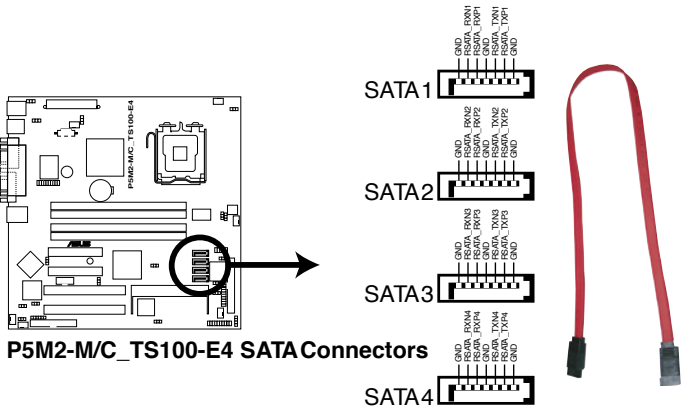
3. Serial ATA connectors (7-pin SATA1, SATA2, SATA3, SATA4)

These connectors are for the Serial ATA signal cables for Serial ATA hard disk drives.

If you installed Serial ATA hard disk drives, you can create a RAID 0 and RAID 1 configuration using the Intel® Matrix Storage Technology or the LSI MegaRAID® utility embedded in the Intel® ICH7R Southbridge.



These connectors are set **IDE** mode by default. In **IDE** mode, you can connect Serial ATA boot/data hard disk drives to these connectors. If you intend to create a Serial ATA RAID set using these connectors, set the **Configure SATA as** item in the BIOS to [RAID]. See section “4.3.4 IDE Configuration” for details.



**Important notes on Serial ATA**

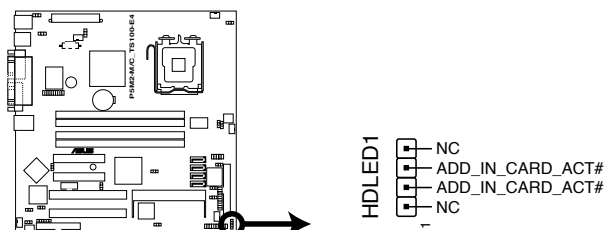
- Use only two Serial ATA RAID connectors for each RAID 0 or RAID 1 set.
- When using the connectors in **IDE** mode, connect the primary (boot) hard disk drive to the SATA1 or SATA2 connector. Refer to the table below for the recommended SATA hard disk drive connections.

Serial ATA hard disk drive connection

Connector	Setting	Use
SATA1/SATA2	Master	Boot disk
SATA3/SATA4	Slave	Data disk

#### 4. Hard disk activity LED connector (4-pin HDLED1)

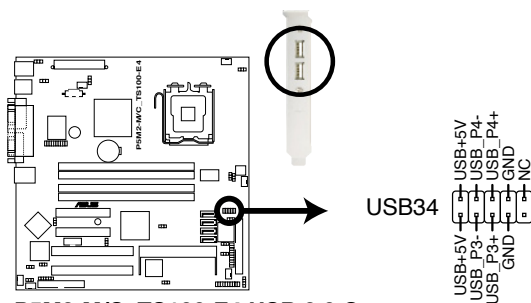
This connector supplies power to the hard disk activity LED. The read or write activities of any device connected to the SCSI connectors or the SATA connectors cause this LED to light up.



**P5M2-M/C\_TS100-E4 SCSI/SATACard Activity LED Connector**

#### 5. USB connector (10-1 pin USB34)

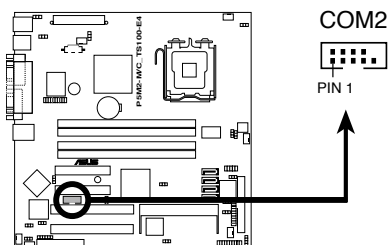
This connector is for USB 2.0 ports. This USB connector complies with USB 2.0 specification that supports up to 480 Mbps connection speed.



**P5M2-M/C\_TS100-E4 USB 2.0 Connector**

## 6. Serial port connector (10-1 pin COM2)

This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis. The serial port module is purchased separately.



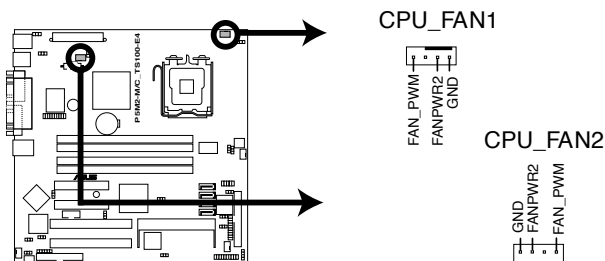
**P5M2-M/C\_TS100-E4 Serial Port2 (COM2) Connector**

## 7. CPU and system fan connectors (3-pin CPU\_FAN1, CPU\_FAN2)

The fan connectors support cooling fans of 350 mA ~ 740 mA (8.88 W max.) or a total of 2.1 A ~ 4.44 A (53.28 W max.) at +12V. Connect the fan cables to the fan connectors on the motherboard, making sure that the black wire of each cable matches the ground pin of the connector.



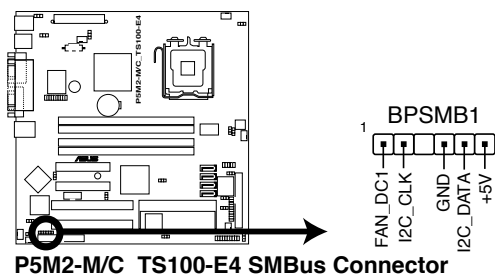
Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!



**P5M2-M/C\_TS100-E4 CPU Fan connectors**

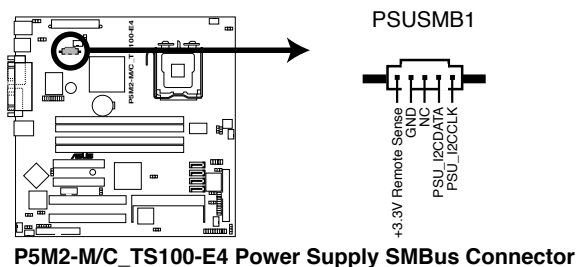
8. Backplane SMBus connector (6-1 pin BPSMB1)

This connector allows you to connect SMBus (System Management Bus) devices. Devices communicate with an SMBus host and/or other SMBus devices using the SMBus interface.



9. Power supply SMBus connector (5-pin PSUSMB1)

This connector is for the power supply SMB cable, if your power supply supports the SMBus function.

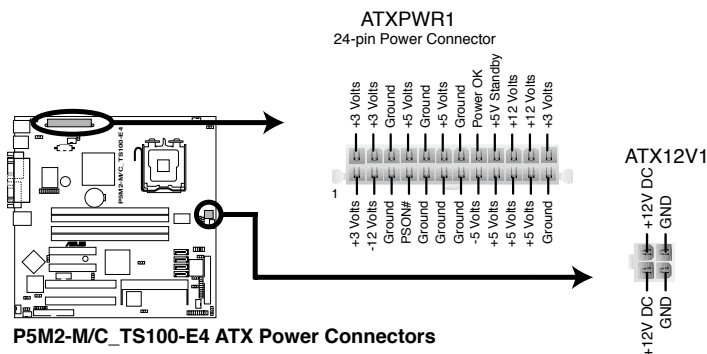


## 10. Power connectors (24-pin ATXPWR1, 4-pin ATX12V2)

These connectors are for power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.



- Use of an 12 V Specification 2.0-compliant power supply unit (PSU) that provides a minimum power of 250 W is recommended for a fully-configured system.
- Do not forget to connect the 4-pin ATX +12 V power plug; otherwise, the system will not boot up.
- We recommend that you use a PSU with a higher power output when configuring a system with more power consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- You must install a PSU with a higher power rating if you intend to install additional devices.



## 11. Auxiliary panel connector (20-pin AUX\_PANEL1)

This connector is for additional front panel features including front panel SMB, locator LED and switch, chassis intrusion, and LAN LEDs.

- Front panel SMB (6-1 pin FPSMB)

These leads connect the front panel SMBus cable.

- LAN activity LED (2-pin LAN1\_LED, LAN2\_LED)

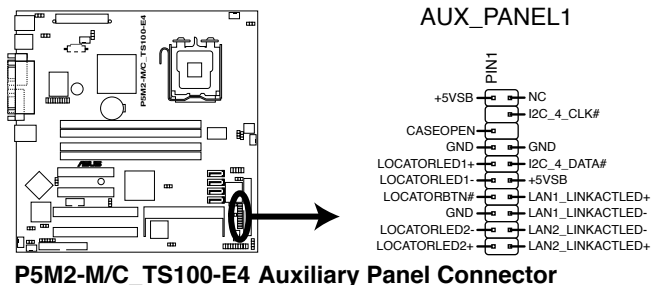
These leads are for Gigabit LAN activity LEDs on the front panel.

- Chassis intrusion (2-pin CHASSIS)

These leads are for the intrusion detection feature for chassis with intrusion sensor or microswitch. When you remove any chassis component, the sensor triggers and sends a high-level signal to these leads to record a chassis intrusion event.

- Locator LED (6-pin LOCATOR)

These leads are for the locator switch and LED on the front panel.





## 12. System panel connector (20-pin PANEL1)

This connector supports several chassis-mounted functions.

- **System power LED (Green 3-pin PLED)**

This 3-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

- **Message LED (Brown 2-pin MLED)**

This connector is for the message LED cable that connects to the front message LED. The message LED indicates the booting status. The LED blinks when the system is in the boot process until the operating system is loaded.

- **Hard disk drive activity LED (Red 2-pin IDE\_LED)**

This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector. The IDE LED lights up or flashes when data is read from or written to the HDD.

- **System warning speaker (Orange 4-pin SPEAKER)**

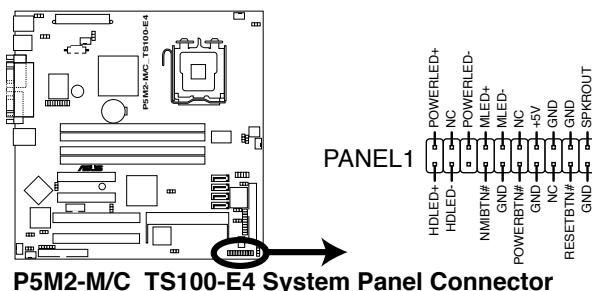
This 4-pin connector is for the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

- **ATX power button/soft-off button (Light Green 2-pin PWRSW)**

This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the BIOS settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

- **Reset button (Blue 2-pin RESET)**

This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.



The system panel connector is color-coded for easy connection.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Chapter 4

This chapter tells how to change the system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.



# BIOS Setup

## 4.1 Managing and updating your BIOS

The following utilities allow you to manage and update the motherboard Basic Input/Output System (BIOS) setup.

1. **ASUS AFUDOS** (Updates the BIOS in DOS mode using a bootable floppy disk.)
2. **ASUS CrashFree BIOS 2** (Updates the BIOS using a bootable floppy disk or the motherboard support CD when the BIOS file fails or gets corrupted.)
3. **ASUS Update** (Updates the BIOS in Windows® environment.)

Refer to the corresponding sections for details on these utilities.



---

Save a copy of the original motherboard BIOS file to a bootable floppy disk in case you need to restore the BIOS in the future. Copy the original motherboard BIOS using the ASUS Update or AFUDOS utilities.

---

### 4.1.1 Creating a bootable floppy disk

To create a bootable floppy disk in a DOS environment:

- a. Insert a 1.44MB floppy disk into the drive.
- b. At the DOS prompt, type `format A: /s` then press <Enter>.

## 4.1.2 AFUDOS utility

The AFUDOS utility allows you to update the BIOS file in DOS environment using a bootable floppy disk with the updated BIOS file. This utility also allows you to copy the current BIOS file that you can use as backup when the BIOS fails or gets corrupted during the updating process.

### Copying the current BIOS

To copy the current BIOS file using the AFUDOS utility:



- Make sure that the floppy disk is not write-protected and has at least 1024 KB free space to save the file.
- The succeeding BIOS screens are for reference only. The actual BIOS screen displays may not be same as shown.

1. Copy the AFUDOS utility (afudos.exe) from the motherboard support CD to the bootable floppy disk you created earlier.
2. Boot the system in DOS mode, then at the prompt type:

```
afudos /o[filename]
```

where the [filename] is any user-assigned filename not more than eight alphanumeric characters for the main filename and three alphanumeric characters for the extension name.

```
A:\>afudos /oOLDBIOS1.rom
```

Main filename    Extension name

3. Press <Enter>. The utility copies the current BIOS file to the floppy disk.

```
A:\>afudos /oOLDBIOS1.rom
AMI Firmware Update Utility - Version 1.19(ASUS V2.07(03.11.24BB))
Copyright (C) 2002 American Megatrends, Inc. All rights reserved.
Reading flash ..... done
Write to file..... ok
A:\>
```

The utility returns to the DOS prompt after copying the current BIOS file.

## Updating the BIOS file

To update the BIOS file using the AFUDOS utility:

1. Visit the ASUS website ([www.asus.com](http://www.asus.com)) and download the latest BIOS file for the motherboard. Save the BIOS file to a bootable floppy disk.



---

Write the BIOS filename on a piece of paper. You need to type the exact BIOS filename at the DOS prompt.

---

2. Copy the AFUDOS utility (afudos.exe) from the motherboard support CD to the bootable floppy disk you created earlier.
3. Boot the system in DOS mode, then at the prompt type:

```
afudos /i[filename]
```

where [filename] is the latest or the original BIOS file on the bootable floppy disk.

```
A:\>afudos /iTS100-E4.ROM
```

4. The utility verifies the file and starts updating the BIOS.

```
A:\>afudos /iTS100-E4.ROM
AMI Firmware Update Utility - Version 1.19(ASUS V2.07(03.11.24BB))
Copyright (C) 2002 American Megatrends, Inc. All rights reserved.

WARNING!! Do not turn off power during flash BIOS
Reading file ..... done
Reading flash ..... done

Advance Check .....
Erasing flash ..... done
Writing flash ..... 0x0008CC00 (9%)
```



---

Do not shut down or reset the system while updating the BIOS to prevent system boot failure!

---

5. The utility returns to the DOS prompt after the BIOS update process is completed. Reboot the system from the hard disk drive.

```
A:\>afudos /iTS100-E4.ROM
AMI Firmware Update Utility - Version 1.19 (ASUS V2.07 (03.11.24BB))
Copyright (C) 2002 American Megatrends, Inc. All rights reserved.

WARNING!! Do not turn off power during flash BIOS
Reading file ..... done
Reading flash ..... done

Advance Check .....
Erasing flash ..... done
Writing flash ..... done
Verifying flash .... done

Please restart your computer

A:\>
```

## Updating the BIOS file using a USB flash drive

If you have not purchased a USB floppy disk drive, you may update the BIOS file using a USB flash drive. Format the USB flash drive to FAT16 or 32 system file before updating the BIOS.

To format the USB flash drive to a FAT32/16 system file:

1. Insert the USB flash drive to an available USB port.
2. From the Windows desktop, click **Start**, then select **My computer**.
3. Right-click the USB flash drive icon, then select **Format** from the menu.
4. From the **File system** field, select **FAT32** or **FAT16**, then click the **Start** button.

To update the BIOS file:

1. Copy the original or the latest BIOS file and the AFUDOS utility (afudos.exe) to the USB flash drive.
2. Insert the USB flash drive to an available USB port, then place the motherboard support CD to the optical drive.
3. Boot the system from the support CD, then select the **FreeDOS command prompt**.
4. At the DOS prompt, replace the prompt with the USB flash disk drive letter, then type: **afudos /i [filename]**
5. Follow the instructions in the previous section to update the BIOS file.

### 4.1.3 ASUS CrashFree BIOS 2 utility

The ASUS CrashFree BIOS 2 is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can update a corrupted BIOS file using the motherboard support CD or the floppy disk that contains the updated BIOS file.



- Prepare the motherboard support CD or the floppy disk containing the updated motherboard BIOS before using this utility.
- Make sure that you rename the original or updated BIOS file in the floppy disk to **TS100-E4.ROM**.

### Recovering the BIOS from a floppy disk

To recover the BIOS from a floppy disk:

1. Turn on the system.
2. Insert the floppy disk with the original or updated BIOS file to the floppy disk drive.
3. The utility displays the following message and automatically checks the floppy disk for the original or updated BIOS file.

```
Bad BIOS checksum. Starting BIOS recovery...
Checking for floppy...
```

When found, the utility reads the BIOS file and starts flashing the corrupted BIOS file.

```
Bad BIOS checksum. Starting BIOS recovery...
Checking for floppy...
Floppy found!
Reading file "TS100-E4.ROM". Completed.
Start flashing...
```



DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

4. Restart the system after the utility completes the updating process.



## Recovering the BIOS from the support CD

To recover the BIOS from the support CD:

1. Remove any floppy disk from the floppy disk drive, then turn on the system.
2. Insert the support CD to the optical drive.
3. The utility displays the following message and automatically checks the floppy disk for the original or updated BIOS file.

```
Bad BIOS checksum. Starting BIOS recovery...  
Checking for floppy...
```

When no floppy disk is found, the utility automatically checks the optical drive for the original or updated BIOS file. The utility then updates the corrupted BIOS file.

```
Bad BIOS checksum. Starting BIOS recovery...  
Checking for floppy...  
Floppy not found!  
Checking for CD-ROM...  
CD-ROM found!  
Reading file "TS100-E4.ROM". Completed.  
Start flashing...
```



---

DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

---

4. Restart the system after the utility completes the updating process.



---

The recovered BIOS may not be the latest BIOS version for this motherboard. Visit the ASUS website ([www.asus.com](http://www.asus.com)) to download the latest BIOS file.

---

### 4.1.4 ASUS Update utility

The ASUS Update is a utility that allows you to manage, save, and update the motherboard BIOS in Windows® environment. The ASUS Update utility allows you to:

- Save the current BIOS file
- Download the latest BIOS file from the Internet
- Update the BIOS from an updated BIOS file
- Update the BIOS directly from the Internet, and
- View the BIOS version information.

This utility is available in the support CD that comes with the motherboard package.



---

ASUS Update requires an Internet connection either through a network or an Internet Service Provider (ISP).

---

### Installing ASUS Update

To install ASUS Update:

1. Place the support CD in the optical drive. The **Drivers** menu appears.
2. Click the **Utilities** tab, then click **Install ASUS Update Vx.XX.XX**.
3. The ASUS Update utility is copied to your system.



---

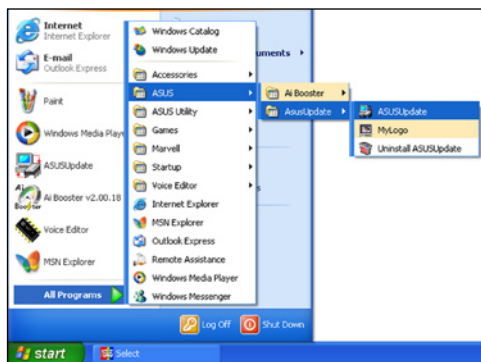
Quit all Microsoft® Windows® applications before you update the BIOS using this utility.

---

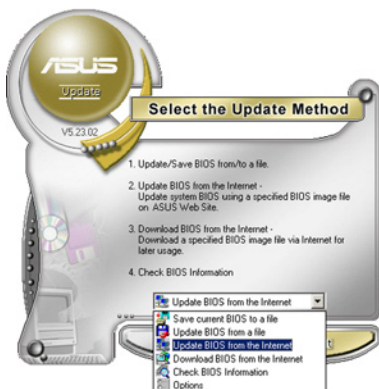
## Updating the BIOS through the Internet

To update the BIOS through the Internet:

1. Launch the ASUS Update utility from the Windows® desktop by clicking **Start > Programs > ASUS > ASUSUpdate > ASUSUpdate**. The ASUS Update main window appears.



2. Select **Update BIOS from the Internet** option from the drop-down menu, then click **Next**.
3. Select the ASUS FTP site nearest you to avoid network traffic, or click **Auto Select**. Click **Next**.



4. From the FTP site, select the BIOS version that you wish to download. Click **Next**.
5. Follow the screen instructions to complete the update process.



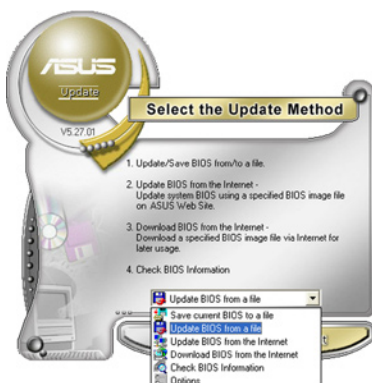
The ASUS Update utility is capable of updating itself through the Internet. Always update the utility to avail all its features.



## Updating the BIOS through a BIOS file

To update the BIOS through a BIOS file:

1. Launch the ASUS Update utility from the Windows® desktop by clicking **Start > Programs > ASUS > ASUSUpdate > ASUSUpdate**. The ASUS Update main window appears.
2. Select **Update BIOS from a file** option from the drop-down menu, then click **Next**.



3. Locate the BIOS file from the **Open** window, then click **Save**.
4. Follow the screen instructions to complete the update process.

## 4.2 BIOS setup program

This motherboard supports a programmable Low-Pin Count (LPC) chip that you can update using the provided utility described in section “4.1 Managing and updating your BIOS.”

Use the BIOS Setup program when you are installing a motherboard, re-configuring your system, or prompted to “Run Setup.” This section explains how to configure your system using this utility.

Even if you are not prompted to use the Setup program, you can change the configuration of your computer in the future. For example, you can enable the security password feature or change the power management settings. This requires you to reconfigure your system using the BIOS Setup program so that the computer can recognize these changes and record them in the CMOS RAM of the LPC chip.

The LPC chip on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press <Del> during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

If you wish to enter Setup after POST, reboot the system by doing any of the following procedures:

- Restart using the OS standard shut-down procedure.
- Press <Ctrl>+<Alt>+<Del> simultaneously.
- Press the reset button on the system chassis.
- Press the power button to turn the system off then back on.



---

Using the power button, reset button, or the <Ctrl>+<Alt>+<Del> keys to force reset from a running operating system can cause damage to your data or system. We recommend to always shut-down the system properly from the operating system.

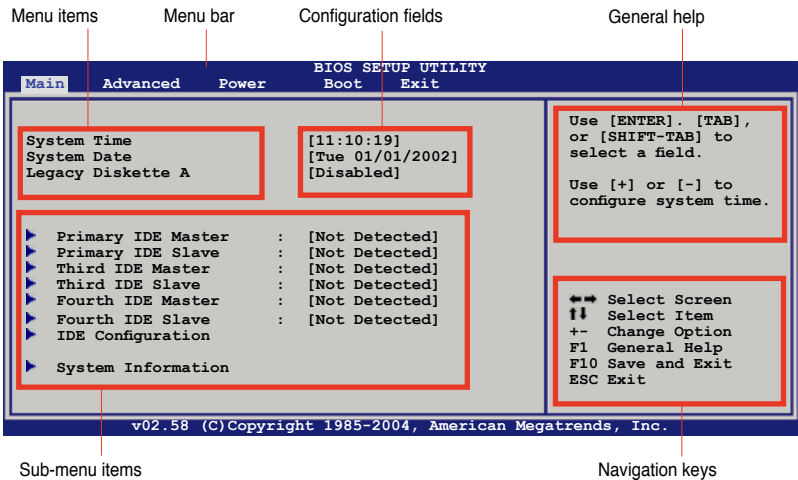
---

The Setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various sub-menus and make your selections from the available options using the navigation keys.



- 
- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Select the Load Default Settings item under the Exit Menu. See section “5.8 Exit Menu.”
  - The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
  - Visit the ASUS website ([www.asus.com](http://www.asus.com)) to download the latest BIOS file for this motherboard.
-

## 4.2.1 BIOS menu screen



## 4.2.2 Menu bar

The menu bar on top of the screen has the following main items:

- Main** For changing the basic system configuration
- Advanced** For changing the advanced system settings
- Power** For changing the Advanced Power Management (APM) configuration
- Boot** For changing the system boot configuration
- Exit** For selecting the exit options and loading default settings

To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

## 4.2.3 Navigation keys

At the bottom right corner of a menu screen are the navigation keys for that particular menu. Use the navigation keys to select items in the menu and change the settings.

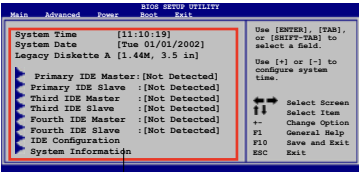


Some of the navigation keys differ from one screen to another.

### 4.2.4 Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting **Main** shows the Main menu items.

The other items (Advanced, Power, Boot, and Exit) on the menu bar have their respective menu items.



Main menu items

### 4.2.5 Sub-menu items

A solid triangle before each item on any menu screen means that the item has a sub-menu. To display the sub-menu, select the item and press <Enter>.

### 4.2.6 Configuration fields

These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable.

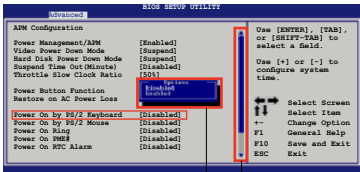
A configurable field is enclosed in brackets, and is highlighted when selected. To change the value of a field, select it then press <Enter> to display a list of options. Refer to “5.2.7 Pop-up window.”

### 4.2.7 Pop-up window

Select a menu item then press <Enter> to display a pop-up window with the configuration options for that item.

### 4.2.8 Scroll bar

A scroll bar appears on the right side of a menu screen when there are items that do not fit on the screen. Press the Up/Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen.



Pop-up window

Scroll bar

### 4.2.9 General help

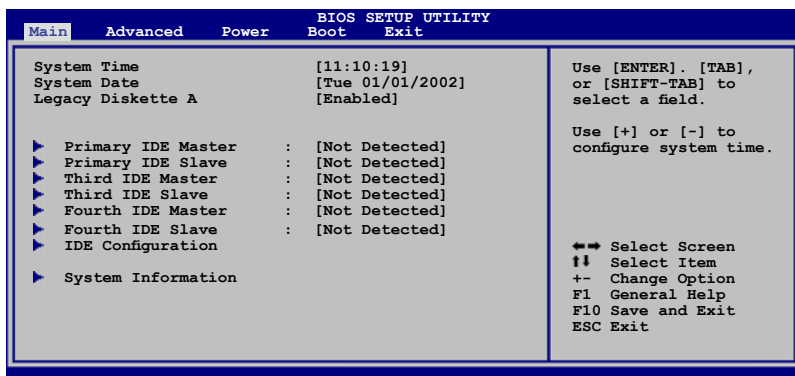
At the top right corner of the menu screen is a brief description of the selected item.

## 4.3 Main menu

When you enter the BIOS Setup program, the **Main** menu screen appears, giving you an overview of the basic system information.



Refer to section “5.2.1 BIOS menu screen” for information on the menu screen items and how to navigate through them.



### 4.3.1 System Time [xx:xx:xx]

Allows you to set the system time.

### 4.3.2 System Date [Day xx/xx/xxxx]

Allows you to set the system date.

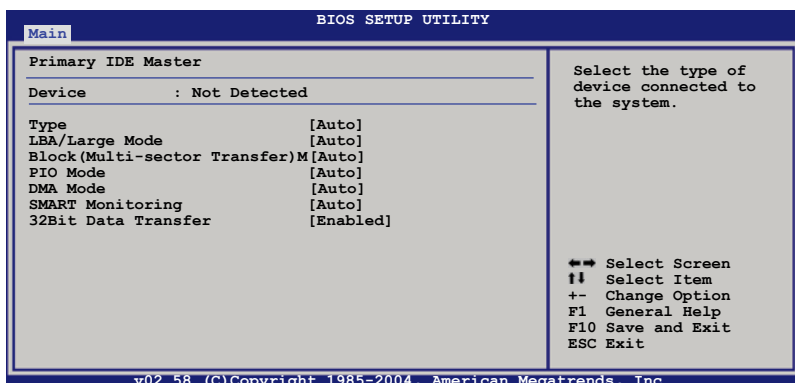
### 4.3.3 Legacy Diskette A [Enabled]

Sets the type of floppy drive installed. Configuration options: [Disabled]  
[360K, 5.25 in.] [1.2M , 5.25 in.] [720K , 3.5 in.] [1.44M, 3.5 in.]  
[2.88M, 3.5 in.]



### 4.3.4 Primary, Third, Fourth IDE Master/Slave

The BIOS automatically detects the connected IDE devices. There is a separate sub-menu for each IDE device. Select a device item, then press <Enter> to display the IDE device information.



The BIOS automatically detects the values opposite the dimmed items (Device, Vendor, Size, LBA Mode, Block Mode, PIO Mode, Async DMA, Ultra DMA, and SMART monitoring). These values are not user-configurable. These items show N/A if no IDE device is installed in the system.

#### Type [Auto]

Selects the type of IDE drive. Setting to [Auto] allows automatic selection of the appropriate IDE device type. Select [CDROM] if you are specifically configuring a CD-ROM drive. Select [ARMD] (ATAPI Removable Media Device) if your device is either a ZIP, LS-120, or MO drive.

Configuration options: [Not Installed] [Auto] [CDROM] [ARMD]

#### LBA/Large Mode [Auto]

Enables or disables the LBA mode. Setting to [Auto] enables the LBA mode if the device supports this mode, and if the device was not previously formatted with LBA mode disabled. Configuration options: [Disabled] [Auto]

#### Block (Multi-sector Transfer) [Auto]

Enables or disables data multi-sectors transfers. When set to [Auto], the data transfer from and to the device occurs multiple sectors at a time if the device supports multi-sector transfer feature. When set to [Disabled], the data transfer from and to the device occurs one sector at a time. Configuration options: [Disabled] [Auto]

## PIO Mode [Auto]

Selects the PIO mode. Configuration options: [Auto] [0] [1] [2] [3] [4]

## DMA Mode [Auto]

Selects the DMA mode. Configuration options: [Auto] [SWDMA0] [SWDMA1] [SWDMA2] [MWDMA0] [MWDMA1] [MWDMA2] [UDMA0] [UDMA1] [UDMA2] [UDMA3] [UDMA4] [UDMA5]

## SMART Monitoring [Auto]

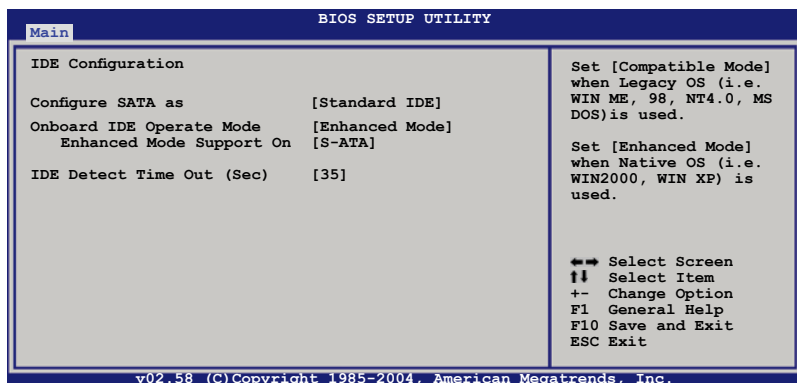
Sets the Smart Monitoring, Analysis, and Reporting Technology. Configuration options: [Auto] [Disabled] [Enabled]

## 32Bit Data Transfer [Enabled]

Enables or disables 32-bit data transfer.  
Configuration options: [Disabled] [Enabled]

## 4.3.5 IDE Configuration

The items in this menu allow you to set or change the configurations for the IDE devices installed in the system. Select an item then press <Enter> if you wish to configure the item.



## Configure SATA As [Standard IDE]

Sets the configuration for the Serial ATA connectors supported by the Southbridge chip.

If you want to use the Serial ATA hard disk drives as Parallel ATA physical storage devices, set this item to [Standard IDE].

Onboard IDE Operate Mode [Enhanced Mode]

Allows selection of the onboard IDE operation mode depending on the installed operating system (OS). Set to [Enhanced] if you are using native OS, e.g. Windows® 2000/XP. Set to [Compatible] if you are using legacy OS, e.g. Windows ME/98/NT, MS-DOS. Configuration options: [Disabled] [Compatible] [Enhanced]



Set the item **Configure SATA as** to [RAID] if you want to use or configure the SATA connectors under SuSE Linux Enterprise Server 9.0 SP1 operating system environment. Due to the OS limitation, you must set a SATA RAID to use any SATA device (at least two SATA devices are needed for the RAID configuration). Refer to Chapter 5 and Chapter 6 for details on how to set a SATA RAID.

Set Configure SATA As to [RAID], if you want to create a RAID 0 or RAID1, configurations using the Intel® Matrix Storage Manager or if you want to create a RAID 0 or RAID 1 configurations using the LSI Logic Embedded SATA RAID Setup Utility.

#### OnBoard Serial-ATA BOOTROM [Disabled]

Allows you to enable or disable the Onboard Serial-ATA BOOTROM.  
Configuration options: [Disabled] [Enabled]

The AHCI allows the onboard storage driver to enable advanced Serial ATA features that enhance storage performance on random workloads by allowing the drive to internally optimize the order of commands.

If you want the Serial ATA hard disk drives to use the Advanced Host Controller Interface (AHCI), set this item to [AHCI]. For details on AHCI, go to: [www.intel.com/support/chipsets/imst/sb/CS-012304.htm](http://www.intel.com/support/chipsets/imst/sb/CS-012304.htm)  
[www.intel.com/support/chipsets/imst/sb/CS-012305.htm](http://www.intel.com/support/chipsets/imst/sb/CS-012305.htm)

The SATA controller is set to Native mode when this item is set to [RAID] or [AHCI].

#### ALPE and ASP [Disabled]

Allows you to enable or disable the Aggressive Link Power Management and Aggressive Slumber/Partial Enabled. Configuration options: [Disabled] [Enabled]

#### Stagger Spinup Support [Disabled]

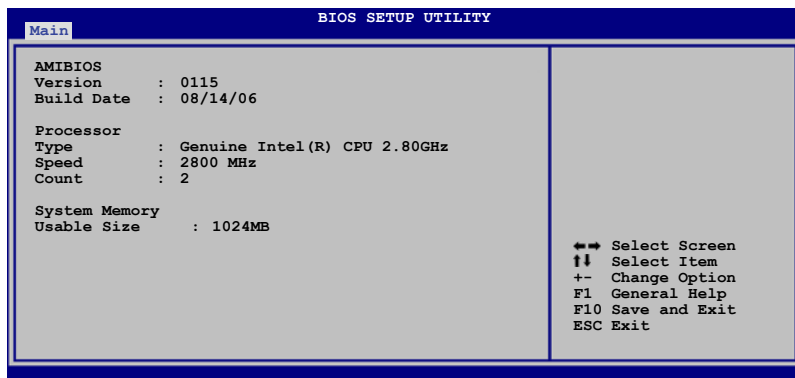
Allows you to enable or disable the Stagger Spinup support function.  
Configuration options: [Disabled] [Enabled]

#### AHCI Port 3 Interlock Switch [Disabled]

Allows you to enable or disable AHCI Port 3 Interlock Switch. Configuration options: [Disabled] [Enabled]

## 4.3.6 System Information

This menu gives you an overview of the general system specifications. The BIOS automatically detects the items in this menu.



### AMI BIOS

Displays the auto-detected BIOS information.

### Processor

Displays the auto-detected CPU specification.

### System Memory

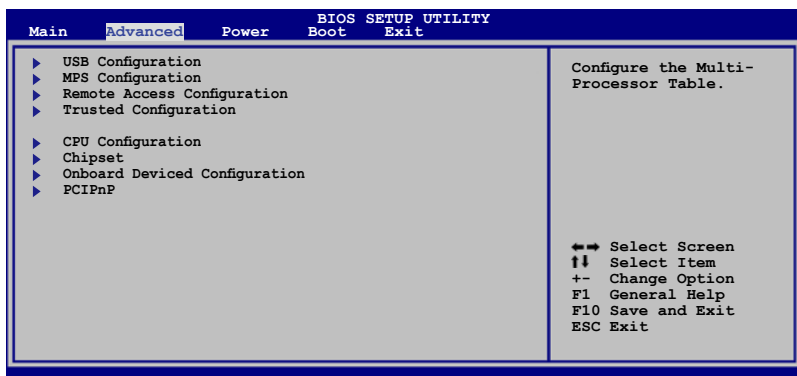
Displays the auto-detected total system memory.

## 4.4 Advanced menu

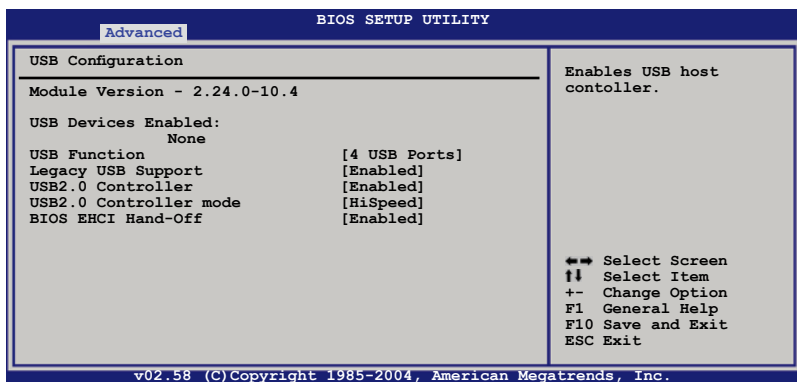
The Advanced menu items allow you to change the settings for the CPU and other system devices.



Take caution when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.



### 4.4.1 USB Configuration



#### USB Function [4 USB Ports]

Allows you to enable a specific number of USB ports, or disable the USB function. Configuration options: [Disabled] [2 USB Ports] [4 USB Ports]



When USB Function set to 2 USB Ports or 4 USB Ports, the following items appear.

#### Legacy USB Support [Enabled]

Allows you to enable or disable support for legacy USB. The AUTO option disables legacy support if there is no USB device connected.  
Configuration options: [AUTO] [2 USB Ports] [4 USB Ports]

#### USB 2.0 Controller [Enabled]

Allows you to enable or disable the USB 2.0 controller.  
Configuration options: [Enabled] [Disabled]

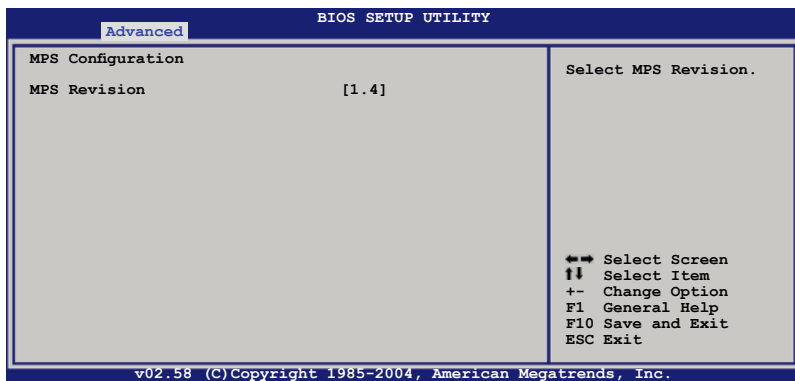
#### USB2.0 Controller mode [HiSpeed]

Allows you to select the USB2.0 controller mode.  
Configuration options: [HiSpeed] [FullSpeed]

#### BIOS EHCI Hand-Off [Enabled]

Allows you to enable or disable the BIOS EHCI Hand-Off support function. Configuration options: [Disabled] [Enabled]

## 4.4.2 MPS Configuration

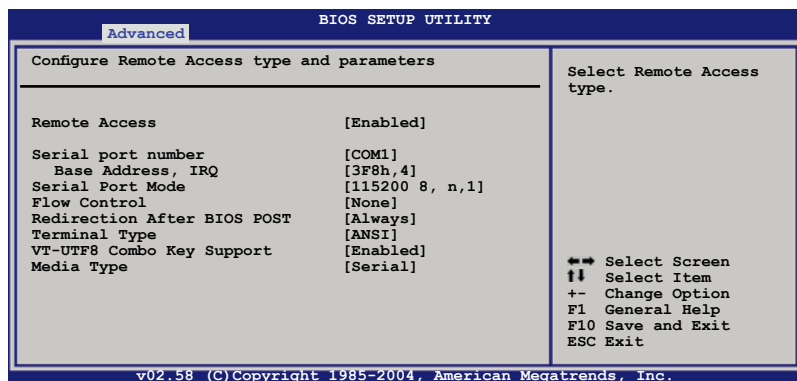


#### MPS Revision [1.4]

Allows you to select the multi-processor system version.  
Configuration options: [1.1] [1.4]

### 4.4.3 Remote Access Configuration

The items in this menu allows you to configure the Remote Access features. Select an item then press <Enter> to display the configuration options.



#### Remote Access [Disabled]

Enables or disables the remote access feature.

Configuration options: [Disabled] [Enabled]



The following items appear only when the **Remote Access** item is set to [Enabled].

#### Serial port number [COM1]

Allows you to select a serial port for console redirection. Configuration options: [COM1] [COM2]

#### Serial Port Mode [115200 8, n, 1]

Allows you to select a serial port mode. Configuration options: [115200 8,n,1] [57600 8,n,1] [38400 8,n,1] [19200 8,n,1] [09600 8,n,1]

#### Flow Control [None]

Allows you to set the flow control for console redirection. Configuration options: [None] [Hardware] [Software]

#### Redirection After BIOS POST [Always]

Sets the redirection mode after the BIOS Power-On Self-Test (POST). Some operating systems may not work when this item is set to Always.

Configuration options: [Disabled] [Boot Loader] [Always]

## Terminal Type [ANSI]

Allows you to select the target terminal type. Configuration options: [ANSI] [VT100] [VT-UTF8]

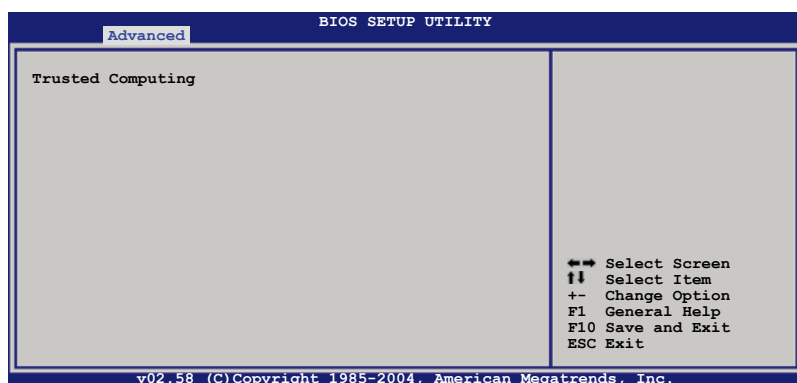
## VT-UTF8 Combo Key Support [Enabled]

Allows you to enable or disable VT-UTF8 Combination Key Support for ANSI/VT100 terminals. Configuration options: [Enabled] [Disabled]

## Media Type [Serial]

Allows you to select the media for console redirection. Configuration options: [Serial] [LAN] [Serial + LAN]

## 4.4.4 Trusted Computing



Use this option to configure settings related to trusted computing innovations.



---

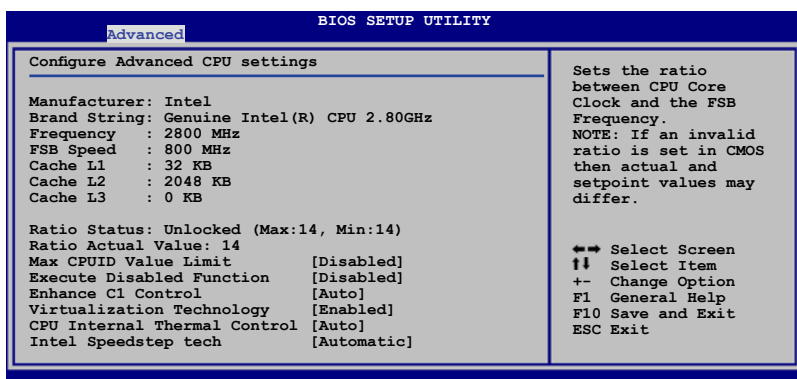
You need to install ASUS TPM card to make this feature function.

---



## 4.4.5 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects.



### Max CPUID Value Limit [Disabled]

Setting this item to [Enabled] allows legacy operating systems to boot even without support for CPUs with extended CPUID functions.  
Configuration options: [Disabled] [Enabled]

### Execute Disabled Function [Disabled]

Allows you to enable or disable the Execute Disabled function. Configuration options: [Disabled] [Enabled]

### Enhanced C1 Control [Auto]

Allows you to disable or set to Auto the Enhanced C1 Control. Configuration options: [Auto] [Disabled]

### Virtualization Technology [Enabled]

Allows you to enable or disable the Virtualization Technology feature. Configuration options: [Disabled] [Enabled]

### CPU Internal Thermal Control [Auto]

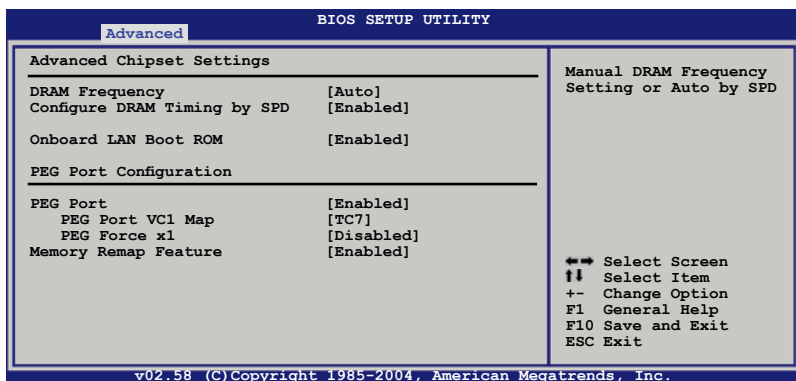
Allows you to set CPU internal thermal control. If set to Auto, BIOS automatically check CPU's capability to enable TM or TM2 support. In TM mode, CPU power consumption is reduced; in TM2 mode, CPU core ratio and VID is reduced. Configuration options: [Auto] [Disabled]

### Intel Speedstep tech [Automatic]

CPU speed controlled by Operating system. Disabled: Default CPU speed. Configuration options: [Automatic] [Disabled]

## 4.4.6 Chipset

The Chipset Configuration menu allows you to change the advanced chipset settings. Select an item then press <Enter> to display the sub-menu.



### DRAM Frequency [Auto]

Allows you to set the DDR operating frequency.

Configuration options: [Auto] [533 MHz] [667 MHz]

### Configure DRAM Timing by SPD [Enabled]

When this item is enabled, the DRAM timing parameters are set according to the DRAM SPD (Serial Presence Detect). When disabled, you can manually set the DRAM timing parameters through the DRAM sub-items. The following sub-items appear when this item is disabled. Configuration options: [Disabled] [Enabled]

### DRAM CAS# Latency [5 Clocks]

Controls the latency between the SDRAM read command and the time the data actually becomes available. Configuration options: [5 Clocks] [4 Clocks] [3 Clocks] [6 Clocks]

### DRAM RAS# Precharge [4 Clocks]

Controls idle clocks after issuing a precharge command to the DDR SDRAM. Configuration options: [2 Clocks] [3 Clocks] [4 Clocks] [5 Clocks]

### DRAM RAS# to CAS# Delay [4 Clocks]

Controls the latency between the DDR SDRAM active command and the read/write command. Configuration options: [2 Clocks] [3 Clocks] [4 Clocks] [5 Clocks]

### DRAM RAS# Activate to Precharge Delay [15 DRAM Clocks]

Configuration options: [1 Clocks] [2 Clocks] ~ [15 Clocks]

DRAM Write Recovery Time [4 Clocks]

Configuration options: [2 Clocks] [3 Clocks] [4 Clocks] [5 Clocks]

### **Onboard LAN Boot ROM [Enabled]**

Allows you to enable or disable the option ROM in the onboard LAN controller. Configuration options: [Disabled] [Enabled]



---

If Onboard LAN Boot ROM item set to [Disabled], The system also undetected the LAN device while add PCI LAN card.

---

### **PEG Port Configuration**

PEG Port [Enabled]

Allows you to enable or disable the PCI Express Graphic port.

Configuration options: [Enabled] [Disabled]



---

The PEG Force x1 item appear only when the PEG Port item is set to [Enabled].

---

PEG Port VC1 Map [Enabled]

Configuration options: [TC1] ~ [TC7]

PEG Force x1 [Disabled]

Configuration options: [Disabled] [Enabled]

### **Memory Remap Feature [Enabled]**

Allows you to remap the overlap PCI memory over the total physical memory. Configuration options: [Disabled] [Enabled]



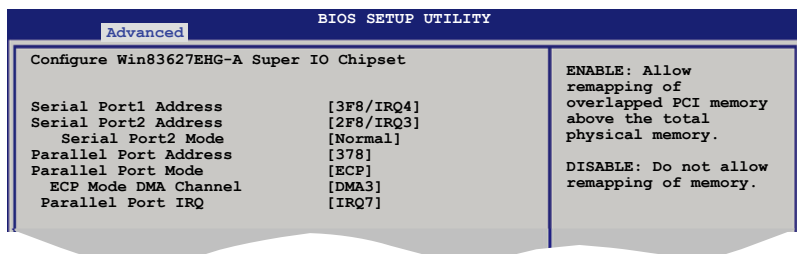
---

Disable this item if you are using RedHat Linux Advanced Server 3.0 UP5/UP6 operating system.

---

## 4.4.7 Onboard Devices Configuration

The Onboard Devices Configuration menu allows you to change the onboard devices settings. Select an item then press <Enter> to display the sub-menu.



### Serial Port1 Address [3F8/IRQ4]

Allows you to select the Serial Port1 base address.

Configuration options: [Disabled] [3F8/IRQ4] [3E8/IRQ4] [2E8/IRQ3]

### Serial Port2 Address [2F8/IRQ3]

Allows you to select the Serial Port2 base address.

Configuration options: [Disabled] [2F8/IRQ3] [3E8/IRQ4] [2E8/IRQ3]

### Serial Port2 Mode [Normal]

Allows you to select the Serial Port2 mode.

Configuration options: [Normal] [IrDA] [ASK IR]

### Parallel Port Address [378]

Allows you to select the Parallel Port base addresses.

Configuration options: [Disabled] [378] [278] [3BC]

### Parallel Port Mode [ECP]

Allows you to select the Parallel Port mode.

Configuration options: [Normal] [Bi-directional] [ECP] [EPP]

#### EPP Version [1.9]

Allows selection of the Parallel Port EPP version. This item appears when the Parallel Port Mode is set to [EPP] or [ECP & EPP].

Configuration options: [1.9] [1.7]

#### ECP Mode DMA Channel [DMA3]

Appears when the Parallel Port Mode is set to [ECP] or [ECP & EPP]. This item allows you to set the Parallel Port ECP DMA.

Configuration options: [DMA0] [DMA1] [DMA3]

### Parallel Port IRQ [IRQ7]

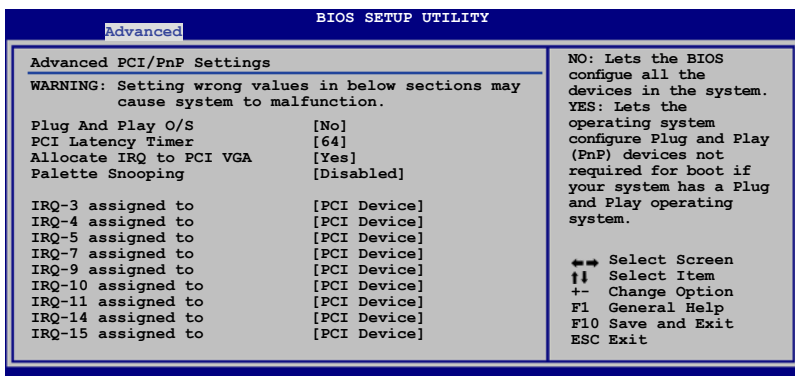
Sets the Parallel port IRQ. Configuration options: [IRQ5] [IRQ7]

## 4.4.8 PCI PnP

The PCI PnP menu items allow you to change the advanced settings for PCI/PnP devices. The menu includes setting IRQ and DMA channel resources for either PCI/PnP or legacy ISA devices, and setting the memory size block for legacy ISA devices.



Take caution when changing the settings of the PCI PnP menu items. Incorrect field values can cause the system to malfunction.



### Plug And Play O/S [No]

When set to [No], BIOS configures all the devices in the system. When set to [Yes] and if you install a Plug and Play operating system, the operating system configures the Plug and Play devices not required for boot. Configuration options: [No] [Yes]

### PCI Latency Timer [64]

Allows you to select the value in units of PCI clocks for the PCI device latency timer register. Configuration options: [32] [64] [96] [128] [160] [192] [224] [248]

### Allocate IRQ to PCI VGA [Yes]

When set to [Yes], BIOS assigns an IRQ to PCI VGA card if the card requests for an IRQ. When set to [No], BIOS does not assign an IRQ to the PCI VGA card even if requested. Configuration options: [No] [Yes]

### Palette Snooping [Disabled]

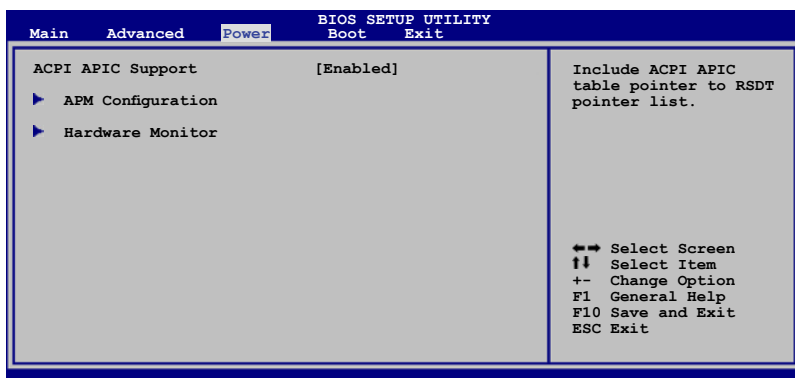
When set to [Enabled], the palette snooping feature informs the PCI devices that an ISA graphics device is installed in the system so that the latter can function correctly. Configuration options: [Disabled] [Enabled]

### IRQ-xx assigned to [PCI Device]

When set to [PCI Device], the specific IRQ is free for use of PCI/PnP devices. When set to [Reserved], the IRQ is reserved for legacy ISA devices. Configuration options: [PCI Device] [Reserved]

## 4.5 Power Configuration

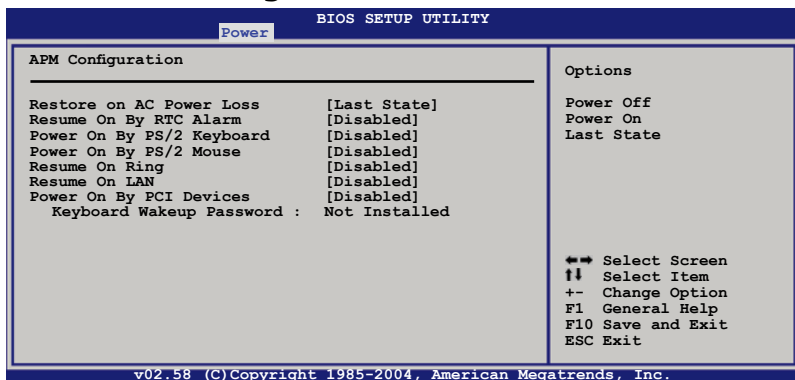
The Power Configuration menu items allow you to change the settings for the ACPI and Advanced Power Management (APM) features. Select an item then press <Enter> to display the configuration options.



### ACPI APIC Support [Enabled]

Allows you to enable or disable the Advanced Configuration and Power Interface (ACPI) support in the Advanced Programmable Interrupt Controller (APIC). When set to Enabled, the ACPI APIC table pointer is included in the RSDT pointer list. Configuration options: [Disabled] [Enabled]

### 4.5.1 APM Configuration



### Restore on AC Power Loss [Last State]

When set to Power Off, the system goes into off state after an AC power loss. When set to Power On, the system goes on after an AC power loss. When set to Last State, the system goes into either off or on state, whatever the system state was before the AC power loss.

Configuration options: [Power Off] [Power On] [Last State]

## **Resume On By RTC Alarm [Disabled]**

Allows you to enable or disable RTC to generate a wake event. When this item is set to [Enabled], the items RTC Alarm Date, RTC Alarm Hour, RTC Alarm Minute, and RTC Alarm Second appear with set values.

Configuration options: [Disabled] [Enabled]



---

The following items appear only when the **Resume On By RTC Alarm** item is set to Enabled.

---

### **RTC Alarm Date (Days) [15]**

To set the alarm date, highlight this item and press the <+> or <-> key to make the selection. Configuration options: [Everyday] [1] [2] [3]...[31]

### **System Time [12:30:30]**

To set the alarm time, highlight this item and press the <+> or <-> key to make the selection.

## **Power On By PS/2 Keyboard [Disabled]**

Allows you to use specific keys on the keyboard to turn on the system. This feature requires an ATX power supply that provides at least 1A on the +5VSB lead. Configuration options: [Disabled] [Enabled]

## **Power On By PS/2 Mouse [Disabled]**

When set to [Enabled], this parameter allows you to use the PS/2 mouse to turn on the system. This feature requires an ATX power supply that provides at least 1A on the +5VSB lead. Configuration options: [Disabled] [Enabled]

## **Resume On Ring [Disabled]**

When set to [Enabled], the system enables the RI to generate a wake event while the computer is in Soft-off mode.

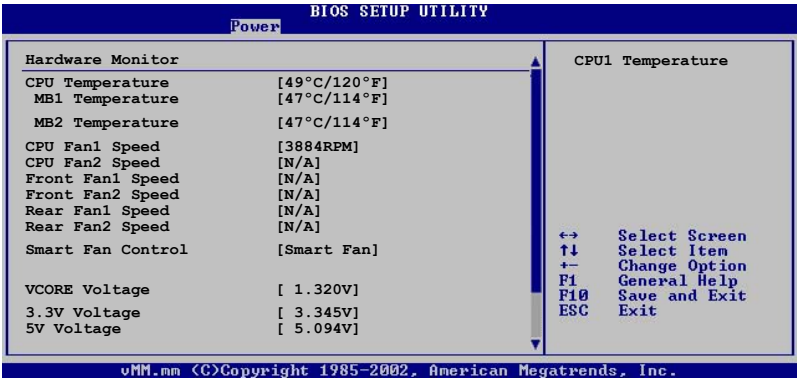
Configuration options: [Disabled] [Enabled]

## **Power on By PCI Devices [Disabled]**

When set to [Enabled], this parameter allows you to turn on the system through a PCI LAN or Modem card. This Feature requires an ATX power supply that provides at least 1A on the +5VSB lead.

Configuration options: [Disabled] [Enabled]

# 4.5.2 Hardware Monitor



Use the arrow down key to display additional items.



## CPU Temperature [xxx°C/xxx°F]

## MB1 Temperature [xxx°C/xxx°F]

The onboard hardware monitor automatically detects and displays the motherboard and CPU temperatures. Select [Ignored] if you do not wish to display the detected temperatures.

## CPU Fan1/2 Speed [xxxxRPM] or [N/A]

## Front Fan1/2 Speed [xxxxRPM] or [N/A]

## Rear Fan1/2 Speed [xxxxRPM] or [N/A]

The onboard hardware monitor automatically detects and displays the CPU, front, and rear fan speed in rotations per minute (RPM). If the fan is not connected to the motherboard, the field shows N/A.

## Smart Fan Control [Enabled]

Allows you to enable or disable the ASUS Smart Fan feature that smartly adjusts the fan speeds for more efficient system operation. Configuration options: [Disabled] [Enabled]



The **CPU Temperature** and **MB Temperature** items appear when you set the **Smart Fan Control** item to [Enabled].

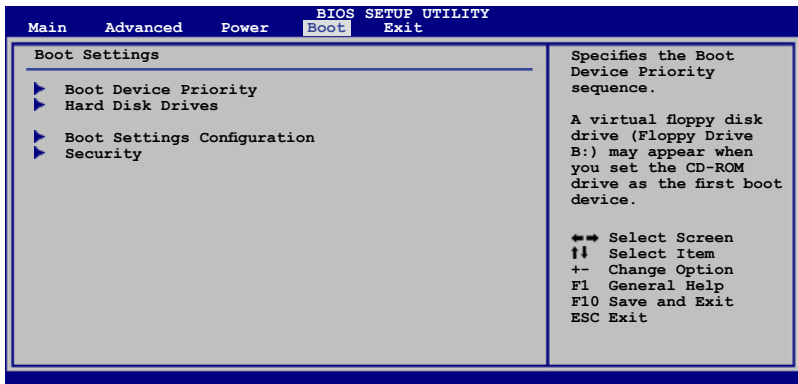


## VCORE1 Voltage, VCORE2 Voltage, 3.3V Voltage, 5V Voltage, 5VSB Voltage, VBAT Voltage, 12V Voltage

The onboard hardware monitor automatically detects the voltage outputs through the onboard voltage regulators.

## 4.6 Boot menu

The Boot menu items allow you to change the system boot options. Select an item then press <Enter> to display the sub-menu.



## 4.6.1 Boot Device Priority

BIOS SETUP UTILITY		
Boot		
Boot Device Priority		
1st Boot Device	[Removable dev.]	
2nd Boot Device	[ATAPI CD-ROM]	
3rd Boot Device	[RAID LSI Logic MB]	
4th Boot Device	[Network: MBA V8.3.9]	
5th Boot Device	[Network: MBA V8.3.9]	

**1st Boot Device [1st FLOPPY Drive]**

**2nd Boot Device [Network: MBA v7.7.5]**

**3rd Boot Device [Network: MBA v7.7.5]**

These items specify the boot device priority sequence from the available devices. Configuration options: [xxxxx Drive] [Disabled]

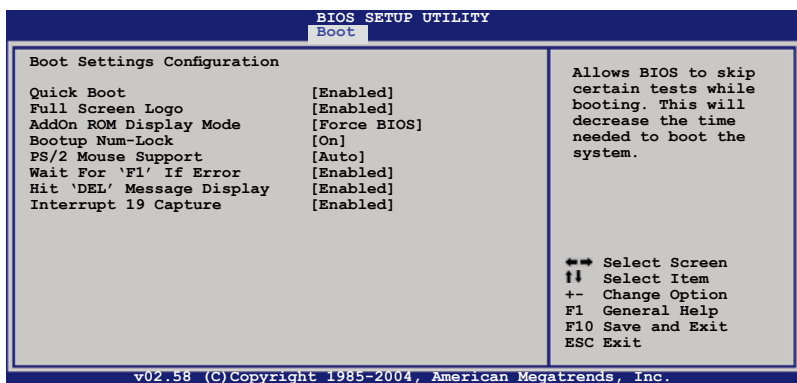
## 4.6.2 Hard Disk Drives

BIOS SETUP UTILITY		
Boot		
Boot Device Priority		
1st Drive	[HDD: XXXXXXXX Drive]	Specifies the Boot Device Priority sequence from available Hard Drives.
2nd Drive	[HDD: XXXXXXXX Drive]	

**1st ~ xxth Drive [HDD: XXXXXXXX Drive]**

These items specify the boot device priority sequence from the available hard disk drives. The number of device items that appears on the screen depends on the number of devices installed in the system. Configuration options: [xxxxx Drive] [Disabled]

## 4.6.3 Boot Settings Configuration



### Quick Boot [Enabled]

Enabling this item allows the BIOS to skip some power on self tests (POST) while booting to decrease the time needed to boot the system. When set to [Disabled], BIOS performs all the POST items.

Configuration options: [Disabled] [Enabled]

### Full Screen Logo [Enabled]

Allows you to enable or disable the full screen logo display feature. Configuration options: [Disabled] [Enabled]



Set this item to [Enabled] to use the ASUS MyLogo2™ feature.

### AddOn ROM Display Mode [Force BIOS]

Allows you to set display mode for optional ROM. Configuration options: [Force BIOS] [Keep Current]

### Bootup Num-Lock [On]

Allows you to select the power-on state for the NumLock.

Configuration options: [Off] [On]

### PS/2 Mouse Support [Auto]

Allows you to enable or disable support for PS/2 mouse.

Configuration options: [Disabled] [Enabled] [Auto]

### Wait for 'F1' If Error [Enabled]

When set to Enabled, the system waits for the F1 key to be pressed when error occurs. Configuration options: [Disabled] [Enabled]

## Hit 'DEL' Message Display [Enabled]

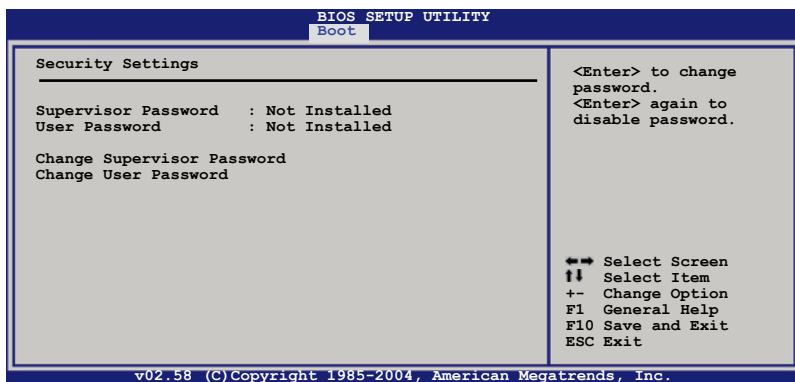
When set to Enabled, the system displays the message “Press DEL to run Setup” during POST. Configuration options: [Disabled] [Enabled]

## Interrupt 19 Capture [Enabled]

When set to [Enabled], this function allows the option ROMs to trap Interrupt 19. Configuration options: [Disabled] [Enabled]

## 4.6.4 Security

The Security menu items allow you to change the system security settings. Select an item then press <Enter> to display the configuration options.



### Change Supervisor Password

Select this item to set or change the supervisor password. The Supervisor Password item on top of the screen shows the default **Not Installed**. After you set a password, this item shows **Installed**.

To set a Supervisor Password:

1. Select the **Change Supervisor Password** item, then press <Enter>.
2. From the password box, type a password composed of at least six letters and/or numbers, then press <Enter>.
3. Confirm the password when prompted.

The message “Password Installed” appears after you successfully set your password.

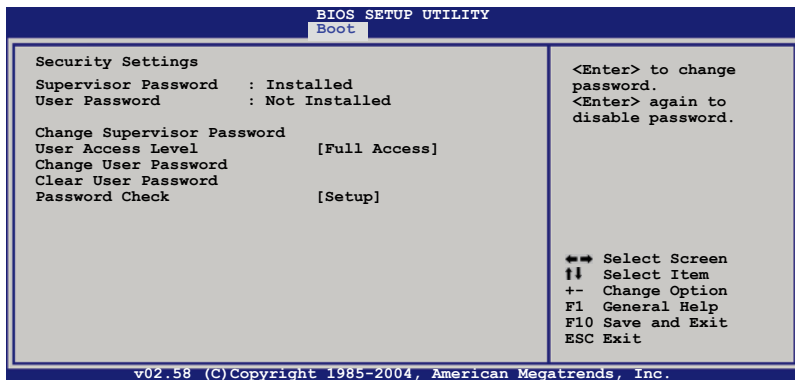
To change the supervisor password, follow the same steps as in setting a user password.

To clear the supervisor password, select the **Change Supervisor Password** then press <Enter>. The message “Password Uninstalled” appears.



If you forget your BIOS password, you can clear it by erasing the CMOS Real Time Clock (RTC) RAM. See section “2.6 Jumpers” for information on how to erase the RTC RAM.

After you have set a supervisor password, the other items appear to allow you to change other security settings.



### User Access Level [Full Access]

This item allows you to select the access restriction to the Setup items. Configuration options: [No Access] [View Only] [Limited] [Full Access]

**No Access** prevents user access to the Setup utility.

**View Only** allows access but does not allow change to any field.

**Limited** allows changes only to selected fields, such as Date and Time.

**Full Access** allows viewing and changing all the fields in the Setup utility.

### Change User Password

Select this item to set or change the user password. The User Password item on top of the screen shows the default **Not Installed**. After you set a password, this item shows **Installed**.

To set a User Password:

1. Select the **Change User Password** item and press <Enter>.
2. On the password box that appears, type a password composed of at least six letters and/or numbers, then press <Enter>.

3. Confirm the password when prompted.

The message “Password Installed” appears after you set your password successfully.

To change the user password, follow the same steps as in setting a user password.

### **Clear User Password**

Select this item to clear the user password.

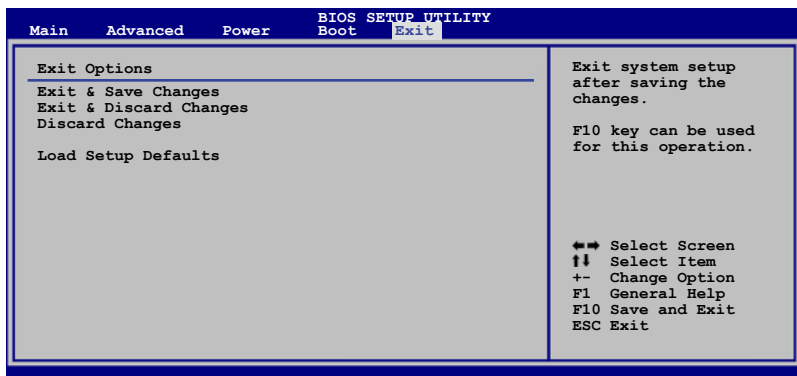
### **Password Check [Setup]**

When set to [Setup], BIOS checks for user password when accessing the Setup utility. When set to [Always], BIOS checks for user password both when accessing Setup and booting the system.

Configuration options: [Setup] [Always]

## 4.7 Exit menu

The Exit menu items allow you to load the optimal or failsafe default values for the BIOS items, and save or discard your changes to the BIOS items.



If you made changes to any of the settings in the menus, pressing <Esc> does not immediately exit this menu. A confirmation window appears and prompts you to either save your changes or cancel the command. Select one of the options from this menu to exit.

### Exit & Save Changes

Select this option then press <Enter>, or simply press <F10>, to save your changes to CMOS before exiting the Setup utility.

When a confirmation window appears, select [OK] then press <Enter> to save your changes and exit Setup. If you wish to cancel the command, select [Cancel] then press <Enter> to return to the Exit menu.

### Exit & Discard Changes

Select this option then press <Enter> to exit the Setup utility without saving your changes.

When a confirmation window appears, select [OK] then press <Enter> to discard your changes and exit Setup. If you wish to cancel the command, select [Cancel] then press <Enter> to return to the Exit menu.

### Discard Changes

Select this option then press <Enter> to discard the changes that you made, and restore the previously saved settings.

When a confirmation window appears, select [OK] then press <Enter> to discard the changes, and load the previously saved settings. If you wish to cancel the command, select [Cancel] then press <Enter> to return to the Exit menu.

### **Load Setup Defaults**

Select this option then press <Enter> to load the optimized settings for each of the Setup menu items.

When a confirmation window appears, select [OK] then press <Enter> to load the default settings. If you wish to cancel the command, select [Cancel] then press <Enter> to return to the Exit menu.



# Chapter 5

This chapter provides instructions for setting up, creating and configuring RAID sets using the available utilities.



# RAID Configuration

## 5.1 RAID configurations

The server system/motherboard comes with the Intel® ICH7R and the LSI Logic Embedded SATA RAID technology built-in the Intel® ICH7R SouthBridge chipset that allows you to configure IDE and Serial ATA hard disk drives as RAID sets. The motherboard supports the following RAID configurations:

### 5.1.1 RAID definitions

**RAID 0** (*Data striping*) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

**RAID 1** (*Data mirroring*) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

**Intel® Matrix Storage.** The Intel® Matrix Storage technology supported by the ICH7R chip allows you to create a RAID 0 and a RAID 1 set using only two identical hard disk drives. The Intel® Matrix Storage technology creates two partitions on each hard disk drive to create a virtual RAID 0 and RAID 1 sets. This technology also allows you to change the hard disk drive partition size without losing any data.



---

If you want to boot the system from a hard disk drive included in a created RAID set, copy first the RAID driver from the support CD to a floppy disk before you install an operating system to the selected hard disk drive. Refer to section “6.1 RAID driver installation” for details.

---

## 5.1.2 Installing Serial ATA hard disks

The motherboard supports Serial ATA hard disk drives. For optimal performance, install identical drives of the same model and capacity when creating a disk array.

To install the SATA hard disks for a RAID configuration:

1. Install the SATA hard disks into the drive bays.
2. Connect the SATA signal cables.
3. Connect a SATA power cable to the power connector on each drive.

## 5.1.3 Setting the RAID item in BIOS

You must set the RAID item in the BIOS Setup before you can create a RAID set(s). To do this:

1. Enter the BIOS Setup during POST.
2. Go to the **Main** Menu, select **IDE Configuration**, then press <Enter>.
3. Select the item **Configure SATA As**, then press <Enter> to display the configuration options.
4. Select **RAID** from the Configure SATA As item options, then press <Enter>.
5. Select the item **Onboard Serial-ATA BOOTROM**, press <Enter>, then select **Enabled** from the options.
6. Save your changes, then exit the BIOS Setup.



---

Refer to Chapter 4 for details on entering and navigating through the BIOS Setup.

---

## 5.1.4 RAID configuration utility

Depending on the RAID\_SEL1 jumper setting and the operating system, you can select a utility to create a RAID set. Refer to section “3.2 Jumpers” for details on the RAID\_SEL1 jumper settings.

Use the Intel® Matrix Storage Manager to create a RAID 0 or RAID 1 set under Windows® 2000/2003 Server/XP operating system.

Use the LSI Logic Embedded SATA RAID Setup Utility to create a RAID 0 or RAID 1 under Windows® 2000/2003 Server or Red Hat® Enterprise ver. 3.0 operating system.

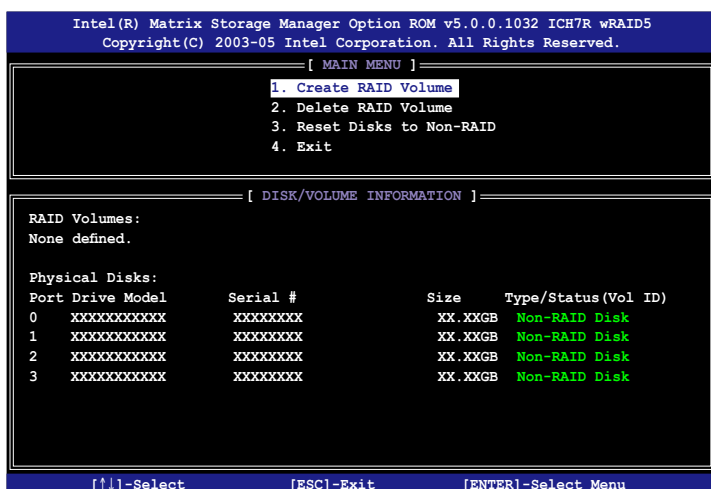
Refer to the succeeding sections for details on how to use the RAID configuration utilities.

## 5.2 Intel® Matrix Storage Manager Option ROM Utility

The Intel® Matrix Storage Manager Option ROM utility allows you to create RAID 0 or RAID 1 from Serial ATA hard disk drives that are connected to the Serial ATA connectors supported by the Southbridge.

To enter the Intel® Application Accelerator RAID Option ROM utility:

1. Install all the Serial ATA hard disk drives.
2. Turn on the system.
3. During POST, press <Ctrl> + <I> to display the utility main menu.



The navigation keys at the bottom of the screen allow you to move through the menus and select the menu options.



The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.

## 5.2.1 Creating a RAID 0 set (striped)

To create a RAID 0 set:

1. From the utility main menu, select **1. Create RAID Volume**, then press <Enter>. This screen appears.

Intel(R) Matrix Storage Manager Option ROM v5.0.0.1032 ICH7R wRAID5  
Copyright(C) 2003-05 Intel Corporation. All Rights Reserved.

[ CREATE ARRAY MENU ]

Name: Volume0  
RAID Level: RAID0(Stripe)  
Disks: Select Disks  
Strip Size: 128KB  
Capacity: 0.0 GB

Create Volume

[ DISK/VOLUME INFORMATION ]

Enter a string between 1 and 16 characters in length that can be used to uniquely identify the RAID volume. This name is case sensitive and cannot contain special characters.

[F4]-Change [TAB]-Next [ESC]-Previous Menu [Enter]-Select

2. Enter a name for the RAID 0 set, then press <Enter>.
3. When the **RAID Level** item is highlighted, press the up/down arrow key to select **RAID 0(Stripe)**, then press <Enter>.
4. When the **Disks** item is highlighted, press <Enter> to select the hard disk drives to configure as RAID. This **SELECT DISKS** screen appears.

[ SELECT DISKS ]

Port	Drive	Model	Serial #	Size	Status
0	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XX.XGB	Non-RAID Disk
1	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XX.XGB	Non-RAID Disk
2	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XX.XGB	Non-RAID Disk
3	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XX.XGB	Non-RAID Disk

Select 2 to 4 disks to use in creating the volume.

[F4]-Previous/Next [SPACE]-Selects [ENTER]-Selection Complete

5. Use the up/down arrow key to highlight a drive, then press <Space> to select. A small triangle marks the selected drive. Press <Enter> after completing your selection.

6. Use the up/down arrow key to select the stripe size for the RAID 0 array, then press <Enter>. The available stripe size values range from 8 KB to 128 KB. The default stripe size is 128 KB.



---

**TIP:** We recommend a lower stripe size for server systems, and a higher stripe size for multimedia computer systems used mainly for audio and video editing.

---

7. Key in the RAID volume capacity that you want, then press <Enter>. The default value indicates the maximum allowed capacity.
8. Press <Enter> when the **Create Volume** item is highlighted. This warning message appears.

WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

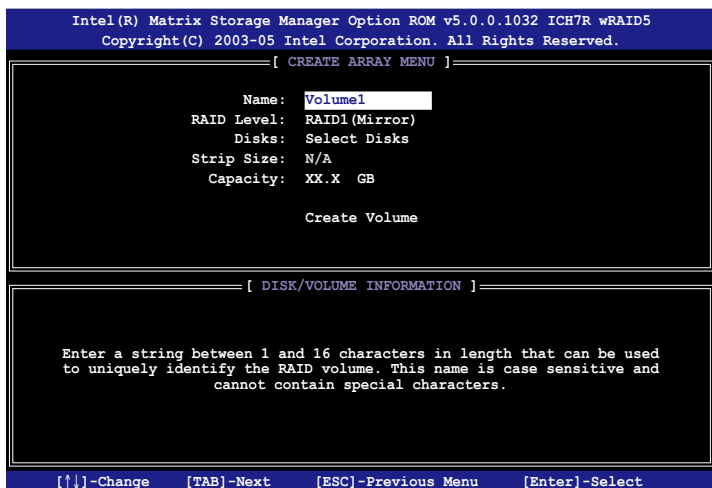
Are you sure you want to create this volume? (Y/N):

9. Press <Y> to create the RAID volume and return to the main menu, or <N> to go back to the Create Volume menu.

## 5.2.2 Creating a RAID 1 set (mirrored)

To create a RAID 1 set:

1. From the utility main menu, select **1. Create RAID Volume**, then press <Enter>. This screen appears.



2. Enter a name for the RAID 1 set, then press <Enter>.
3. When the **RAID Level** item is highlighted, press the up/down arrow key to select **RAID 1 (Mirror)**, then press <Enter>.
4. When the **Disks** item is highlighted, press <Enter> to select the hard disk drives to configure as RAID. The **SELECT DISKS** screen appears.
5. Use the up/down arrow key to highlight a drive, then press <Space> to select. A small triangle marks the selected drive. Press <Enter> after completing your selection.
6. When the **Capacity** item is highlighted, key in the RAID volume capacity that you want, then press <Enter>. The default value indicates the maximum allowed capacity.
7. Press <Enter> when the **Create Volume** item is highlighted. This warning message appears.



8. Press <Y> to create the RAID volume and return to main menu or <N> to go back to Create Volume menu.

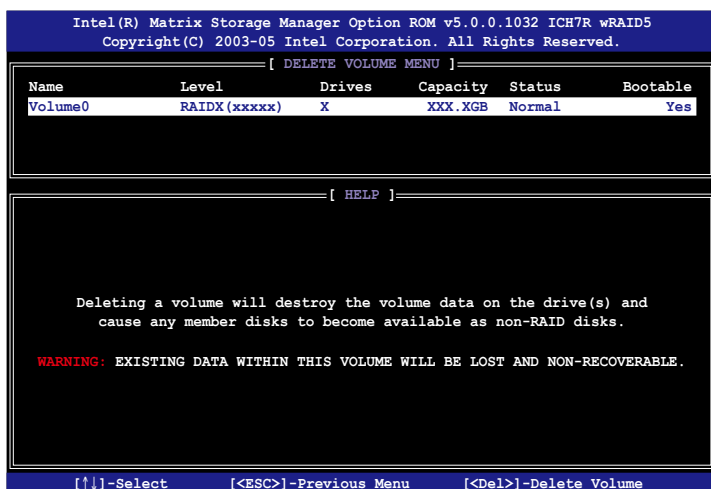
## 5.2.3 Deleting a RAID set



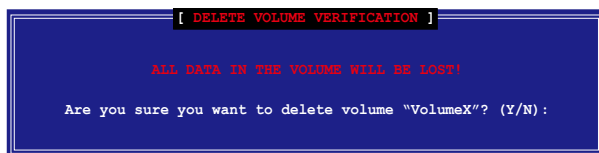
Take caution when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the utility main menu, select **2. Delete RAID Volume**, then press <Enter> to display this screen.



2. Use the up/down arrow key to select the RAID set you want to delete, then press <Del>. This window appears.



3. Press <Y> to delete the RAID set and return to the utility main menu; otherwise, press <N> to return to the Delete Volume menu.



## 5.2.4 Resetting Disks to Non-RAID



Take caution before you reset a RAID volume HDD to non-RAID. Resetting a RAID volume HDD deletes all internal RAID structure on the drive.

To reset a RAID set hard disk drive:

1. From the utility main menu, select **3. Reset Disks to Non-RAID**, then press <Enter> to display this screen.



2. Use the up/down arrow key to highlight the RAID set drive you want to reset, then press <Space> to select.
3. Press <Enter> to reset the RAID set drive. A confirmation message appears.
4. Press <Y> to reset the drive or press <N> to return to the utility main menu.
5. Follow steps 2 to 4 to select and reset other RAID set drives.

## 5.2.5 Exiting the Intel® Matrix Storage Manager utility

To exit the utility:

1. From the utility main menu, select **4. Exit**, then press <Enter>. This window appears.



2. Press <Y> to exit or press <N> to return to the utility main menu.

## 5.2.6 Rebuilding the RAID



This option is only for the RAID 1, RAID 5 and RAID 10 sets.

### Rebuilding the RAID with other non-RAID disk

If any of the SATA hard disk drives included in the RAID array failed, the system displays the status of the RAID volume as **“Degraded”** during POST. You can rebuild the RAID array with other installed non-RAID disks.

To rebuild the RAID with other non-RAID disk:

1. At the prompt, press <Ctrl> + <I> to enter the Intel Matrix Storage Manager RAID configuration.
2. If there is a non-RAID SATA Hard Disk available, the utility will prompt to rebuild the RAID. Press <Enter>, then use up/down arrow keys to select the destination disk or press <ESC> to exit.

```
[DEGRADED VOLUME DETECTED]

"Degraded" volume and disk available for rebuilding detected.
Selecting a disk initiates a rebuild. Rebuild completes in the
operating system.

Select the port of destination disk for rebuilding (ESC to exit):

Port Drive Model      Serial#      Size
3HDS722580VLSA80     VN6Bxxxx    76.7GB

[↑↓]- Previous/Next    [Enter]- Selects    [ESC]- Exit
```



Select a destination disk with the same size as the original hard disk.

3. The utility immediately starts rebuilding after the disk is selected. The status of the degraded RAID volume is changed to **“Rebuild”**.

```
Copyright(C) 2003-05 Intel Corporation. All Rights Reserved.
*****[ MAIN MENU ]*****
1. Create RAID Volume
2. Delete RAID Volume
3. Reset Disks to Non-RAID
4. Exit
*****[ DISK/VOLUME INFORMATION ]*****
RAID Volumes:
ID Name Level Strip Size Status Bootable
0 Volume0 RAID1(Mirror) N/A 74.5GB Rebuild Yes

Physical Disks:
Port Drive Model Serial # Size Type/Status(Vol ID)
1 ST380013AS 5J77HSE9 74.5GB Member Disk(0)
3 HDS722580VLSA80 VN6BHECBWIEKMC 76.7GB Member Disk(0)

Volumes with "Rebuild" status will be rebuilt within the operating system.
*****
[**]-Select [ESC]-Exit [ENTER]-Select Menu
```

4. Exit the RAID configuration utility and reboot the system.
5. Select **Start > Programs > Intel Matrix Storage > Intel Matrix Storage Console** or click the **Intel Matrix Storage Manager** tray icon to load the Intel Matrix Storage Manager utility.
6. From the **View** menu, select **Advanced Mode** to display the details of the Intel Matrix Storage Console.
7. From the **Volumes view** option, select **RAID volume** to view the rebuilding status. When finished, the status is changed to **“Normal”**.

## Rebuilding the RAID with a new hard disk

If any of the SATA hard disk drives included in the RAID array failed, the system displays the status of the RAID volume as **“Degraded”** during POST. You may replace the disk drive and rebuild the RAID array.

To rebuild the RAID with a new hard disk:

1. Remove the failed SATA hard disk and install a new SATA hard disk of the same specification into the same SATA Port.



---

Select a destination disk with the same size as the original hard disk.

---

2. Reboot the system and then follow the steps in section **“Rebuilding the RAID with other non-RAID disk”** on page 5-12.

## 5.2.7 Setting the Boot array in the BIOS Setup Utility

You can set the boot priority sequence in the BIOS for your RAID arrays when creating multi-RAID using the Intel® Matrix Storage Manager.



---

Set at least one of the arrays bootable to boot from the hard disk.

---

To set the boot array in the BIOS:

1. Reboot the system and press <Del> to enter the BIOS setup utility during POST.
2. Go to the **Boot** menu and select the option **Boot Device Priority**.
3. Use up/down arrow keys to select the boot priority and press <Enter>. Refer to “4.6.1 Boot Device Priority” for details.
4. From the **Exit** menu, select **Exit & Save Changes**, then press <Enter>.
5. When the confirmation window appears, select **OK**, then press <Enter>.

## 5.3 LSI Logic Embedded SATA RAID Set-up Utility

The LSI Logic Embedded SATA RAID Setup Utility allows you to create RAID 0 or RAID 1 set(s) from SATA hard disk drives connected to the SATA connectors supported by the motherboard Southbridge chip.



The LSI Logic Embedded SATA RAID automatically configures a RAID 1 (Mirrored) set when the SATA is configured as **RAID** in the BIOS and you installed two hard disk drives without a RAID configuration.

To enter the LSI Logic Embedded SATA RAID Setup Utility:

1. Turn on the system after installing all the SATA hard disk drives.
2. During POST, the LSI Logic Embedded SATA RAID Setup Utility automatically detects the installed SATA hard disk drives and displays any existing RAID set(s). Press <Ctrl> + <M> to enter the utility.

```
LSI Logic Embedded SATA RAID BIOS Version 5.4.06091652R
(c)2004 Copyright LSI Logic Corporation. All Rights Reserved.

LSI Logic Embedded SATA RAID Found at PCI Bus No:00 Dev No:1F
Scanning for Port 0 ... Responding. ST380013AS      76319MB      UDMA 6
Scanning for Port 1 ... Responding. ST380013AS      76319MB      UDMA 6
Scanning for Port 2 ... Responding. ST380023AS      76319MB      UDMA 6
Scanning for Port 3 ... Responding. ST380023AS      76319MB      UDMA 6

LSI Logic Embedded SATA RAID Not Configured!

New Drive(s) Found.

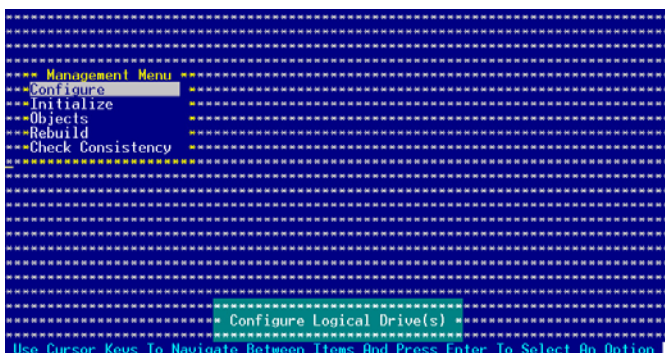
Press Ctrl-M to run LSI Logic Embedded SATA RAID Setup Utility.
```



You may also create a RAID set(s) in a Windows® operating environment using the Global Array Manager (GAM) application. Refer to the GAM user guide in the motherboard support CD for details.

3. The utility main window appears. Use the arrow keys to select an option from the **Management Menu**, then press <Enter>. Refer to the Management Menu descriptions below.

At the bottom of the screen is the legend box. The keys on the legend box allow you to navigate through the setup menu options or execute commands. The keys on the legend box vary according to the menu level.



Menu	Description
Configure	Allows you to create RAID 0 or RAID 1 set using the Easy Configuration or the New Configuration command. This menu also allows you to view, add, or clear RAID configurations or select the boot drive
Initialize	Allows you to initialize the logical drives of a created RAID set
Objects	Allows you to initialize logical drives or change the logical drive parameters
Rebuild	Allows you to rebuild failed drives
Check Consistency	Allows you to check the data consistency of the logical drives of a created RAID set

### 5.3.1 Creating a RAID set

The LSI Logic Embedded SATA RAID Setup Utility allows you to create a RAID 0 or RAID 1 set using two types of configurations: **Easy** and **New**.

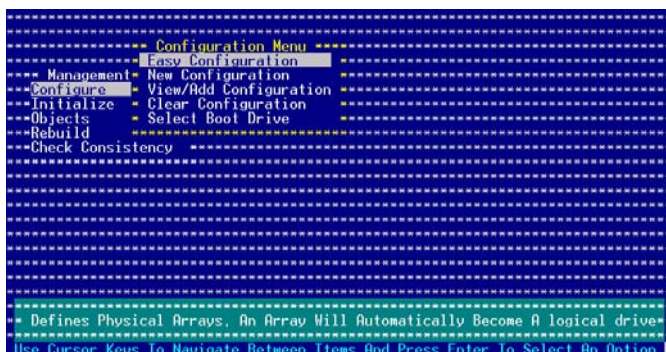
In **Easy Configuration**, the logical drive parameters are set automatically including the size and stripe size (RAID 1 only).

In **New Configuration**, you manually set the logical drive parameters and assign the set size and stripe size (RAID 1 only).

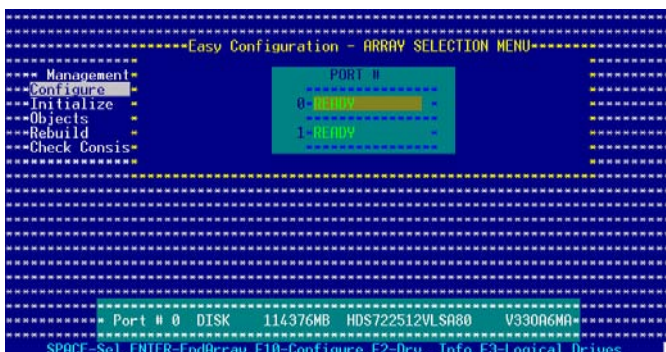
## Using Easy Configuration

To create a RAID set using the **Easy Configuration** option:

1. From the utility main menu, highlight **Configure**, then press <Enter>.
2. Use the arrow keys to select **Easy Configuration**, then press <Enter>.

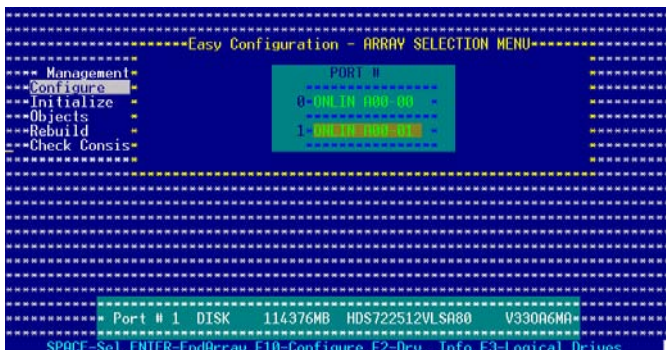


3. The **ARRAY SELECTION MENU** displays the available drives connected to the SATA ports. Select the drives you want to include in the RAID set, then press <SpaceBar>. When selected, the drive indicator changes from **READY** to **ONLIN A[X]-[Y]**, where X is the array number, and Y is the drive number.

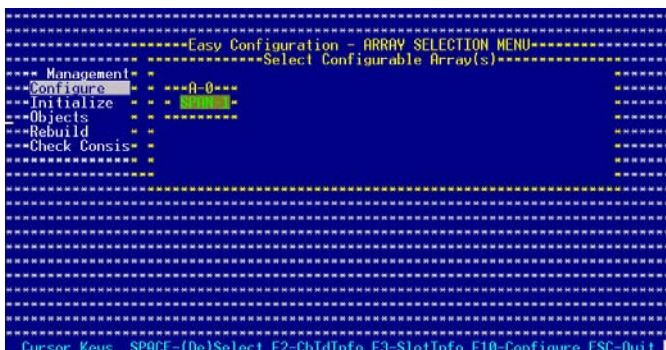


The information of the selected hard disk drive displays at the bottom of the screen.

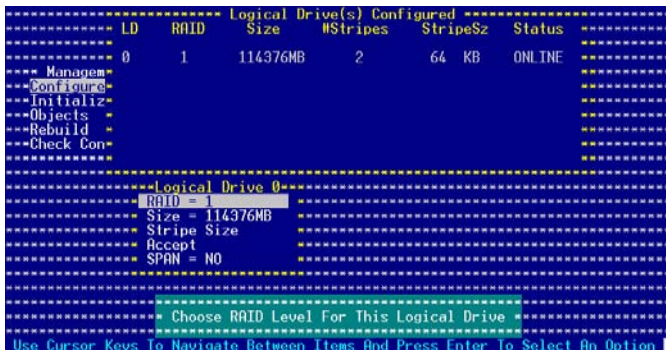
4. Select all the drives required for the RAID set, then press <Enter>. The configurable array appears on screen.



5. Press <F10>, select the configurable array, then press <SpaceBar>.



The logical drive information appears including a Logical Drive menu that allows you to change the logical drive parameters.





6. Select **RAID** from the **Logical Drive** menu, then press <Enter>.
7. Select the RAID level from the menu, then press <Enter>.



You need at least two identical hard disk drives when creating a RAID 1 set.

```

===== Logical Drive(s) Configured =====
===== LD RAID Size #Stripes StripeSz Status =====
===== 0 1 114376MB 2 64 KB ONLINE =====
===== Manage =====
===== Configure =====
===== Initialize =====
===== Objects =====
===== Rebuild =====
===== Check Con =====

===== Logical Drive 0 =====
===== RAID Level =====
===== RAID = 1 =====
===== Size = 114376MB =====
===== Stripe Size =====
===== Accept =====
===== SPAN = NO =====

===== Choose RAID Level For This Logical Drive =====
Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option

```

8. When creating a **RAID 1** set, select **Stripe Size** from the **Logical Drive** menu, then press <Enter>.
- When creating a **RAID 0** set, proceed to step 10.
9. Key in the stripe size, then press <Enter>.

```

===== Logical Drive(s) Configured =====
===== LD RAID Size #Stripes StripeSz Status =====
===== 0 1 114376MB 2 64 KB ONLINE =====
===== Manage =====
===== Configure =====
===== Initialize =====
===== Objects =====
===== Rebuild =====
===== Check C =====

===== Enter Stripe Size In KB (4,8,16,32,64,128)? :64 =====

===== Logical Drive 0 =====
===== RAID = 1 =====
===== Size = 114376MB =====
===== Stripe Size =====
===== Accept =====
===== SPAN = NO =====

===== Enter Stripe Size In KB (4,8,16,32,64,128)? : =====
Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option

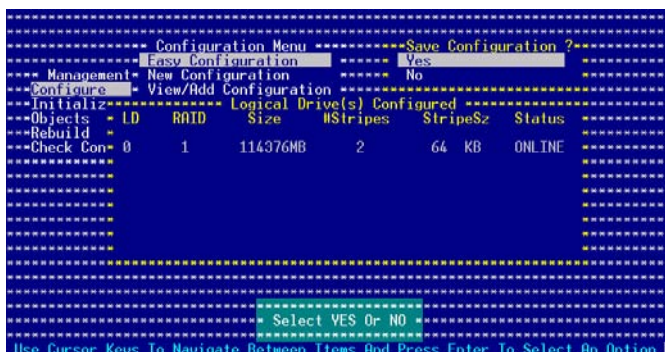
```



For server systems, we recommend that you use a lower array block size. For multimedia computer systems used mainly for audio and video editing, we recommend a higher array block size for optimum performance.



11. Follow steps 5 to 10 to configure additional logical drives.
12. When prompted, save the configuration, then press <Esc> to return to the Management Menu.



## Using New Configuration



When a RAID set is already existing, using the **New Configuration** command erases the existing RAID configuration data. If you do not want to delete the existing RAID set, use the **View/Add Configuration** command to view or create another RAID configuration.

To create a RAID set using the **New Configuration** option:

1. From the utility main menu, highlight **Configure**, then press <Enter>.
2. Use the arrow keys to select **New Configuration**, then press <Enter>.

```
----- Configuration Menu -----
-- Easy Configuration
-- Management
-- Configure
-- Initialize
-- Objects
-- Rebuild
-- Check Consistency
-- View/Add Configuration
-- Clear Configuration
-- Select Boot Drive

-----
Defines Physical Arrays. An Array Will Automatically Become A logical drive
Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option
```

3. Follow steps 3 to 7 of the previous section.
4. Select **Size** from the **Logical Drive** menu, then press <Enter>.
5. Key in the desired logical drive size, then press <Enter>.

```
----- Logical Drive(s) Configured -----
-----
LD   RAID   Size      #Stripes  StripeSz  Status
-----
0    1       114376MB  2         64 KB     ONLINE
-----
-- Management
-- Configure
-- Initialize
-- Objects
-- Rebuild
-- Check Consistency
-- Enter Logical Drive Size (MB) :114376
-- Logical Drive 0
-- RAID = 1
-- Size = 114376MB
-- Stripe Size
-- Accept
-- SPIN = NO
-- Enter Logical Drive Size (MB) :
-----
Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option
```

6. Follow steps 8 to 12 of the previous section to create the RAID set.

### 5.3.2 Adding or viewing a RAID configuration

You can add a new RAID configuration or view an existing configuration using the **View/Add Configuration** command.

#### Adding a new RAID configuration

To add a new RAID configuration:

1. From the Management Menu, highlight **Configure**, then press <Enter>.
2. Use the arrow keys to select **View/Add Configuration**, then press <Enter>.

```
----- Configuration Menu -----
-- Easy Configuration
-- Management
-- Configure
-- Initialize
-- Objects
-- Rebuild
-- Check Consistency
-- View/Add Configuration
-- Clear Configuration
-- Select Boot Drive

----- View/Add To The Existing Configuration -----
Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option
```

3. The **ARRAY SELECTION MENU** displays the available drives connected to the SATA ports. Select the drive(s) you want to include in the RAID set, then press <SpaceBar>. When selected, the drive indicator changes from **READY** to **ONLIN A[X]-[Y]**, where X is the array number, and Y is

```
-----View/Add Configuration - ARRAY SELECTION MENU-----
-- Management
-- Configure
-- Initialize
-- Objects
-- Rebuild
-- Check Consis
-- PORT #
-- 0-READY
-- 1-ONLIN A00-00
-- Port # 0 DISK 114376MB HDS722512VLSA80 V330A6MA
SPACE-Sel ENTER-EndArray F10-Configure F2-Drv Info F3-Logical Drives
```



The information of the selected hard disk drive displays at the bottom of the screen.

4. Select all the drives required for the RAID set, then press <Enter>. The configurable array appears on screen.

```

-----View/Add Configuration - ARRAY SELECTION MENU-----
Management
Configure
Initialize
Objects
Rebuild
Check Consis
-----
PORT #
0 - ONL IN A00-A0 -
1 - ONL IN B00-B0 -
-----
Port # 1 DISK 114376MB HDS722512VLSA80 V330AGMA
SPACE-Sel ENTER-EndArray F10-Configure F2-Drv Info F3-Logical Drives

```

5. Press <F10>, select the configurable array, then press <SpaceBar>.

```

-----View/Add Configuration - ARRAY SELECTION MENU-----
Management
Configure
Initialize
Objects
Rebuild
Check Consis
-----
Select Configurable Array(s)
---0-0---
-----
Cursor Keys SPACE-(De)Select F2-ChIdInfo F3-SlotInfo F10-Configure ESC-Quit

```

The logical drive information appears including a Logical Drive menu that allows you to change the logical drive parameters.

```

-----Logical Drive(s) Configured-----
LD RAID Size #Stripes StripeSz Status
0 1 114376MB 2 64 KB ONL INE
Management
Configure
Initialize
Objects
Rebuild
Check Con
-----
Logical Drive 0
RAID = 1
Size = 114376MB
Stripe Size
Accept
SPAN = NO
-----
Choose RAID Level For This Logical Drive
Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option

```



6. Follow steps 6 to 7 of the **Creating a RAID set: Using Easy Configuration** section.
7. Select **Size** from the **Logical Drive** menu, then press <Enter>.
8. Key in the desired logical drive size, then press <Enter>.

```

===== Logical Drive(s) Configured =====
===== LD  RAID      Size      #Stripes  StripeSz  Status =====
===== 0      1      114376MB  2         64 KB    ONLINE =====
-- Manage --
-- Configure --
-- Initialize --
-- Objects --
-- Rebuild --
-- Check C --
-- Enter Logical Drive Size (MB) :114376 --
=====
===== Logical Drive 0=====
===== RAID = 1=====
===== Size = 114376MB=====
===== Stripe Size=====
===== Accept=====
===== SPAN = NO=====
=====
===== Enter Logical Drive Size (MB) :=====
=====
===== Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option =====

```

9. Follow steps 8 to 12 of the **Creating a RAID set: Using Easy Configuration** section to add the new RAID configuration.

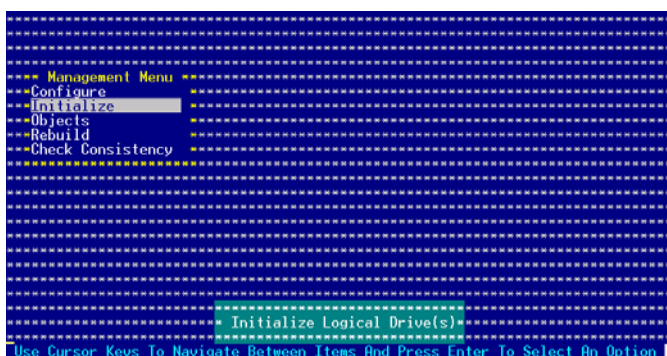
### 5.3.3 Initializing the logical drives

After creating the RAID set(s), you must initialize the logical drives. You may initialize the logical drives of a RAID set(s) using the **Initialize** or **Objects** command in the Management Menu.

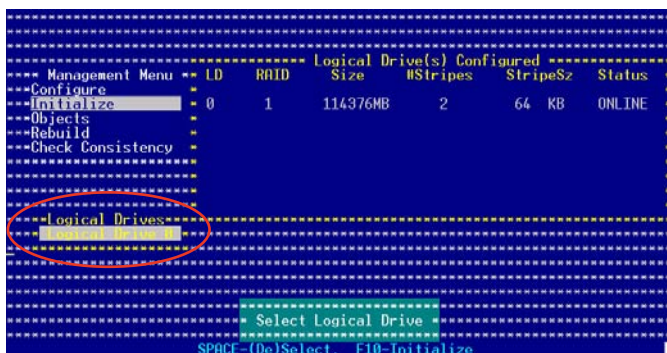
#### Using the Initialize command

To initialize the logical drive using the **Initialize** command:

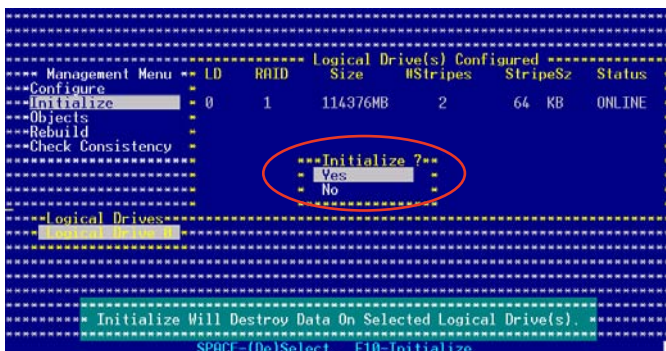
1. From the Management Menu, highlight **Initialize**, then press <Enter>.



2. The screen displays the available RAID set(s) and prompts you to select the logical drive to initialize. Use the arrow keys to select the logical drive from the **Logical Drive** selection, then press <Enter>.

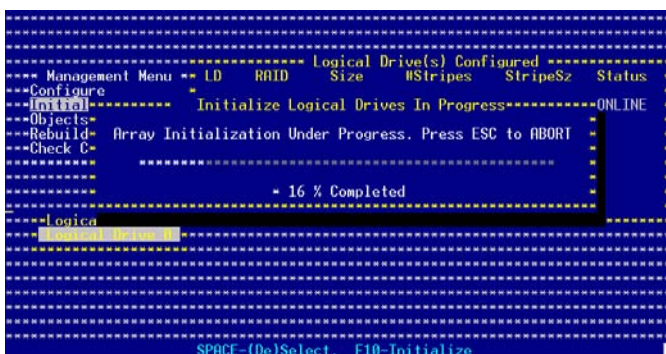


- When prompted, press the <SpaceBar> to select **Yes** from the **Initialize?** dialog box, then press <Enter>. You may also press <F10> to initialize the drive without confirmation.

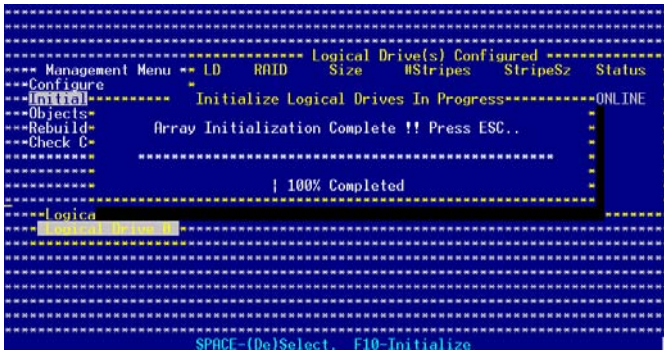


Initializing a logical drive(s) erases all data on the drive.

- A progress bar appears on screen. If desired, press <Esc> to abort initialization.



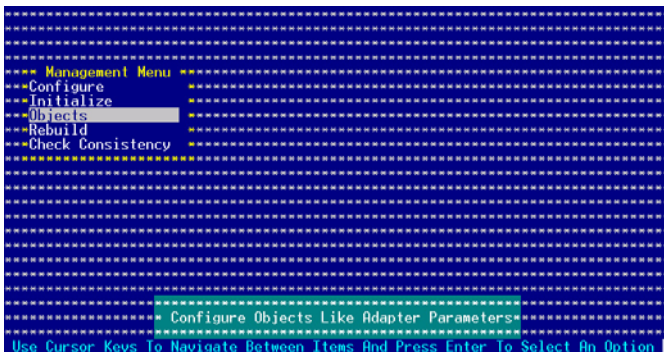
5. When initialization is completed, press <Esc>.



## Using the Objects command

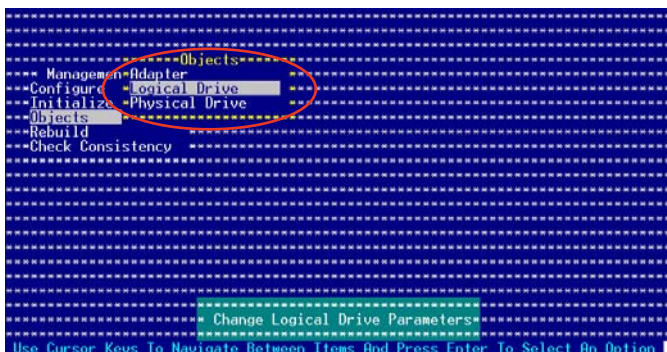
To initialize the logical drives using the **Objects** command:

1. From the Management Menu, highlight **Objects**, then press <Enter>.

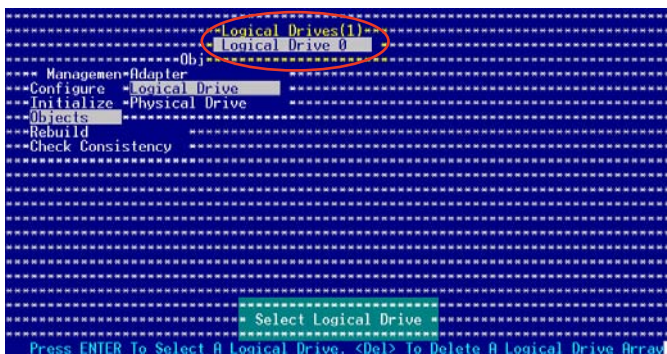




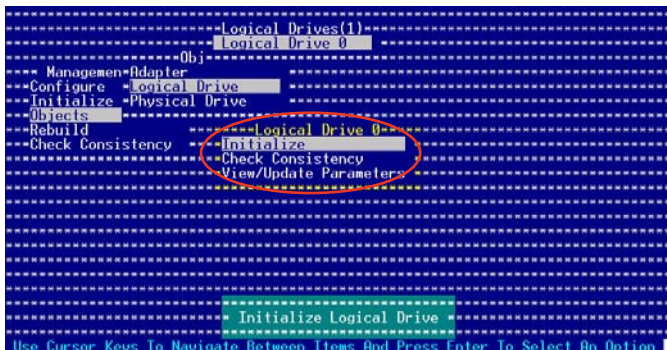
2. Select **Logical Drive** from the **Objects** sub-menu, then press <Enter>.



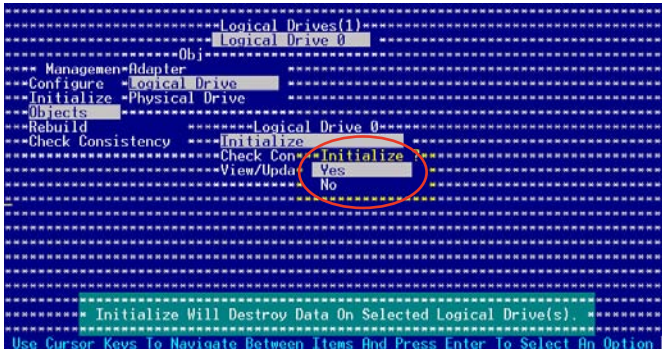
3. Select the logical drive to initialize from the **Logical Drives** sub-menu, then press <Enter>.



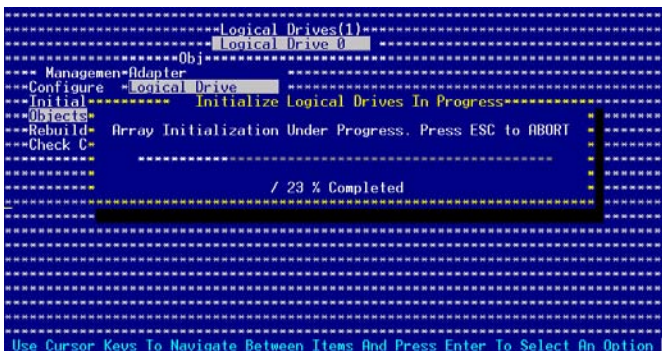
4. Select **Initialize** from the pop-up menu, then press <Enter> to start initialization.



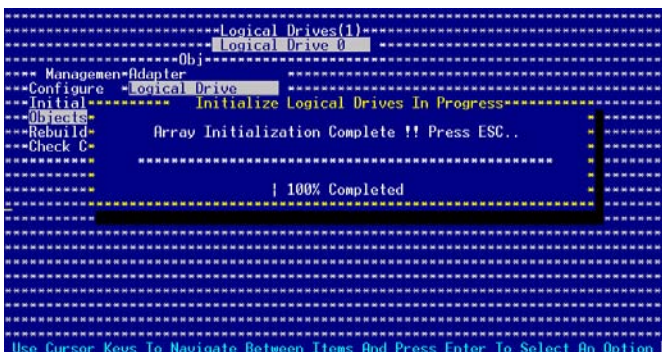
- When prompted, press the <SpaceBar> to select **Yes** from the **Initialize?** dialog box, then press <Enter>. You may also press <F10> to initialize the drive without confirmation.



- A progress bar appears on screen. If desired, press <Esc> to abort initialization.



- When initialization is completed, press <Esc>.



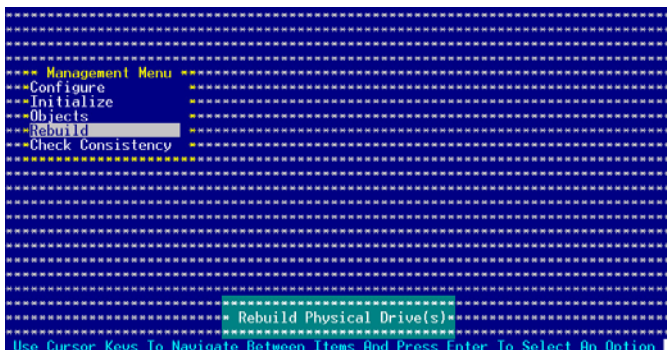
### 5.3.4 Rebuilding failed drives

You can manually rebuild failed hard disk drives using the **Rebuild** or **Objects** command in the Management Menu.

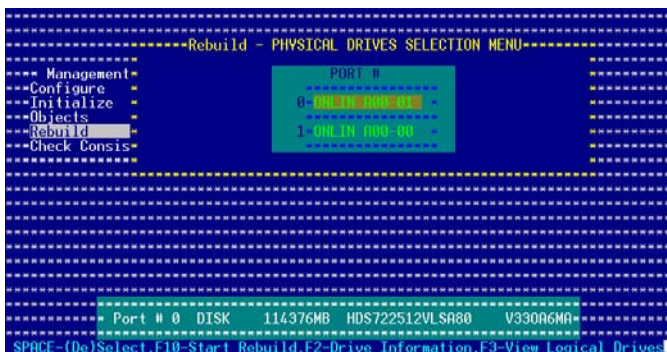
#### Using the Rebuild command

To rebuild a failed hard disk drive using the **Rebuild** command:

1. From the Management Menu, highlight **Rebuild**, then press <Enter>.

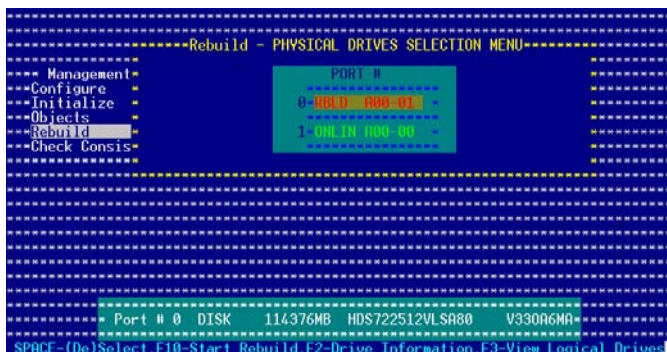


2. The **PHYSICAL DRIVES SELECTION MENU** displays the available drives connected to the SATA ports. Select the drive you want to rebuild, then press <SpaceBar>.

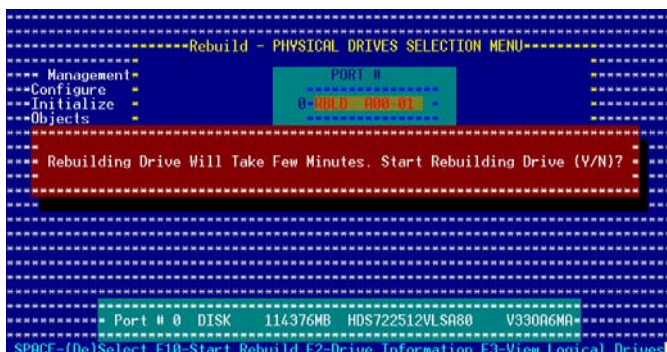




- After selecting the drive to rebuild, press <F10>. The indicator for the selected drive now shows **RBLD**.



- When prompted, press <Y> to to rebuild the drive.



- When rebuild is complete, press any key to continue.

## Using the Objects command

To rebuild a failed hard disk drive using the **Objects** command:

- From the Management Menu, select **Objects**, then select **Physical Drive** from the menu.
- Use the arrow keys to select the physical drive you want to rebuild, then press <Enter>.
- Select **Rebuild** from the pop-up menu, then press <Enter>.
- When prompted, press <Y> to to rebuild the drive.
- When rebuild is complete, press any key to continue.

### 5.3.5 Checking the drives for data consistency

You can check and verify the accuracy of data redundancy in the selected logical drive. The utility can automatically detect and/or detect and correct any differences in data redundancy depending on the selected option in the **Objects > Adapter** menu.

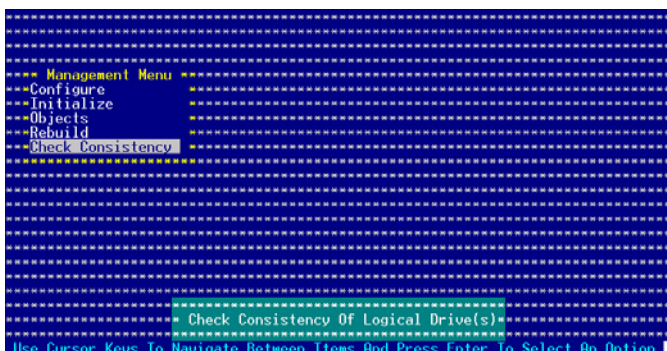


The Check Consistency command is available only for logical drives included in a RAID 1 set.

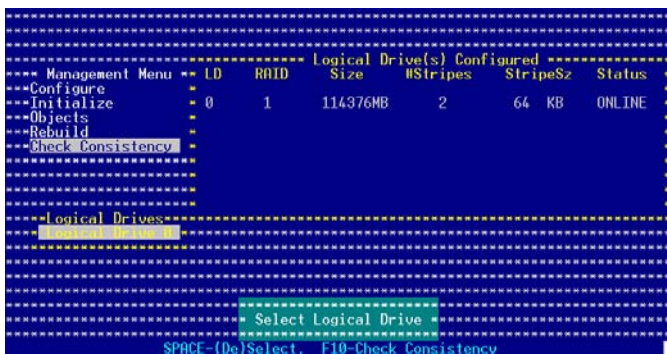
#### Using the Check Consistency

To check data consistency using the **Check Consistency** command:

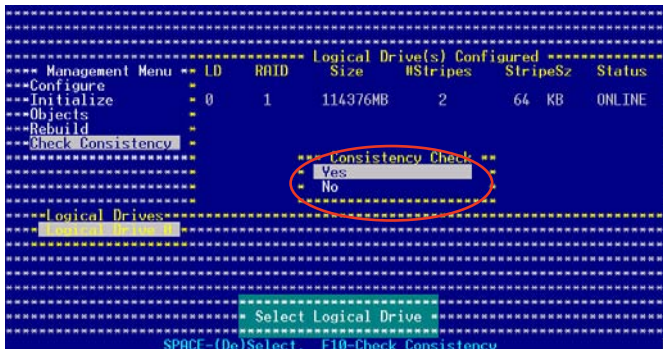
1. From the Management Menu, select **Check Consistency**, then press <Enter>.



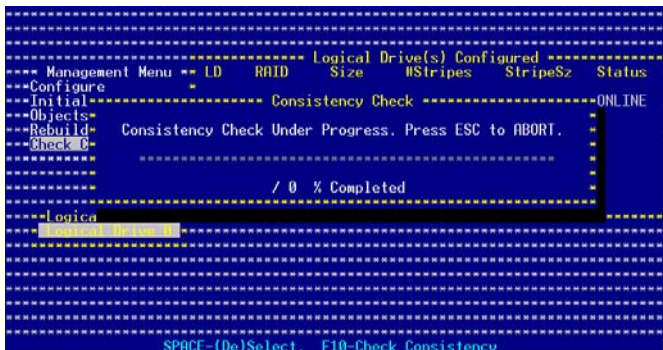
2. The screen displays the available RAID set(s) and prompts you to select the logical drive to check. Use the arrow keys to select the logical drive from the **Logical Drive** selection, then press <Enter>.



- When prompted, press the <SpaceBar> to select **Yes** from the **Consistency Check** dialog box, then press <Enter>. You may also press <F10> to check the drive consistency.



A progress bar appears on screen.



- While checking the disk consistency, press <Esc> to display the following options.
  - Stop - Stops the consistency check. The utility stores the percentage of disk checked. When you restart checking, it continues from the last percentage completed rather than from zero percent.
  - Continue - Continues the consistency check.
  - Abort - Aborts the consistency check. When you restart checking, it continues from zero percent.
- When checking is complete, press any key to continue.

## Using the Objects command

To check data consistency using the **Objects** command:

1. From the Management Menu, select **Objects**, then select **Logical Drive** from the menu.
2. Use the arrow keys to select the logical drive you want to check, then press <Enter>.
3. Select **Check Consistency** from the pop-up menu, then press <Enter>.
4. When prompted, press <Y> to to check the drive.
5. When checking is complete, press any key to continue.

## 5.3.6 Deleting a RAID configuration

To delete a RAID configuration:

1. From the Management Menu, select **Configure > Clear Configuration**, then press <Enter>.

```
----- Configuration Menu -----
-- Easy Configuration
-- Management New Configuration
-- Configure View/Add Configuration
-- Initialize Clear Configuration
-- Objects Select Boot Drive
-- Rebuild
-- Check Consistency
-----

----- Clear Existing Configuration -----

Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option
```

2. When prompted, press the <SpaceBar> to select **Yes** from the **Clear Configuration?** dialog box, then press <Enter>.

```
----- Configuration Menu -----
-- Easy Configuration
-- Management New Configuration
-- Configure View/Add Configuration
-- Initialize Clear Configuration
-- Objects Select Boot Drive
-- Rebuild
-- Check Consistency
-----

----- Clear Configuration? -----
-- Clear Yes
-- Select No
-----

----- Clear Existing Configuration -----

Use Cursor Keys To Navigate Between Items And Press Enter To Select An Option
```

The utility clears the current array.

3. Press any key to continue.

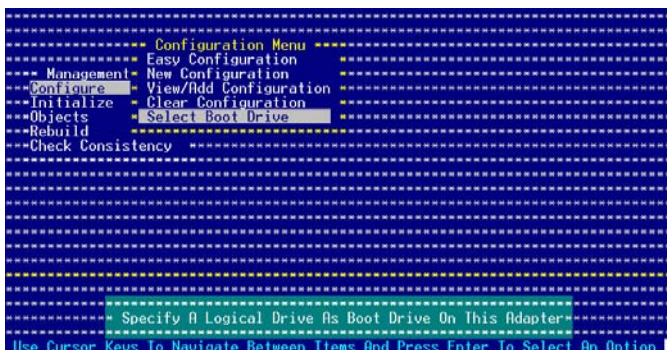


### 5.3.7 Selecting the boot drive from a RAID set

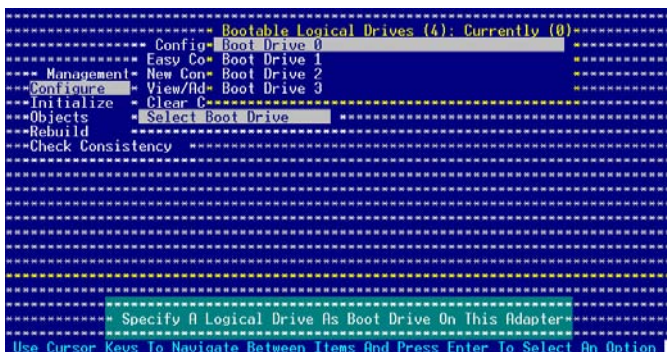
You must have created a new RAID configuration before you can select the boot drive from a RAID set. Refer to the **Creating a RAID set: Using New Configuration** section for details.

To select the boot drive from a RAID set:

1. From the Management Menu, select **Configure > Select Boot Drive**, then press <Enter>.



2. When prompted, press the <SpaceBar> to select the bootable logical drive from the list, then press <Enter>.



3. The logical drive is selected as boot drive. Press any key to continue.

## 5.3.8 Enabling the WriteCache

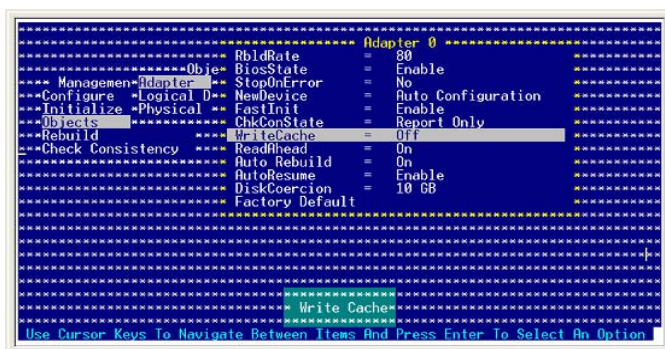
You may enable the RAID controller's **WriteCache** option to improve the data transmission performance.



When you enable WriteCache, you may lose data when a power interruption occurs while transmitting or exchanging data among the drives.

To enable WriteCache:

1. From the Management Menu, select **Objects > Adapter**, then press <Enter> to display the adapter properties.
2. Select **WriteCache**, then press <Enter> to turn the option **On** (enabled).



3. When finished, press any key to continue.

## 5.4 Global Array Manager

You may also create a RAID set(s) in Windows® operating environment using the Global Array Manager (GAM) application. The GAM application is available from the motherboard support CD.



Refer to the GAM user guide in the motherboard support CD for details.

# Chapter 6

This chapter provides instructions for installing the necessary drivers for different system components.



# Driver installation

## 6.1 RAID driver installation

After creating the RAID sets for your server system, you are now ready to install an operating system to the independent hard disk drive or bootable array. This part provides instructions on how to install the RAID controller drivers during OS installation.

### 6.1.1 Creating a RAID driver disk



---

You may have to use another system to create the RAID driver disk from the system/motherboard support CD or from the Internet.

---

A floppy disk with the RAID driver is required when installing Windows® 2000 or Red Hat® Enterprise ver. 3.0/SuSE operating system on a hard disk drive that is included in a RAID set. You can create a RAID driver disk in DOS (using the Makedisk application in the support CD).

To create a RAID driver disk in DOS environment:

1. Place the motherboard support CD in the optical drive.
2. Restart the computer, then enter the BIOS Setup.
3. Select the optical drive as the first boot priority to boot from the support CD. Save your changes, then exit the BIOS Setup.
4. Restart the computer.
5. Press any key when prompted to boot from CD.

```
Loading FreeDOS FAT KERNEL GO!  
Press any key to boot from CDROM...
```

The Makedisk menu appears.

```
A) FreeDOS command prompt  
B) Make Intel ICH7R LSI MegaRAID for Win32/64 bit driver disk  
C) Make Intel ICH7R LSI MegaRAID for RHEL 3 32/64 bit driver disk  
D) Make Intel ICH7R LSI MegaRAID for RHEL 4 32/64 bit driver disk  
E) Flash AMI BIOS for TS100-E4/PI2  
F) Broadcom ASF Firmware Update  
G) Write TS100-E4/PI2 FRU  
Please choose A To G:
```

6. Place a blank, high-density floppy disk to the floppy disk drive, then select the type of RAID driver disk you want to create by typing the number before the option
7. Press <Enter>.
8. Follow screen instructions to create the driver disk.



For systems with Red Hat® Enterprise versions that are not listed in the Makedisk menu, explore the support CD and copy the RAID driver disk from the following path: \ICH7R LSI RAID\Driver\Linux.

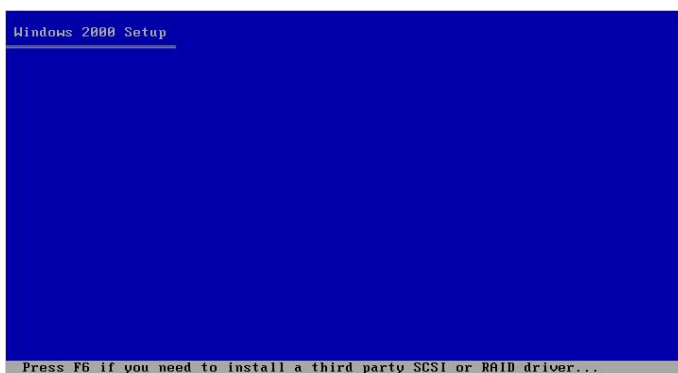
## 6.1.2 Installing the RAID controller driver

### Windows® 2003 Server OS

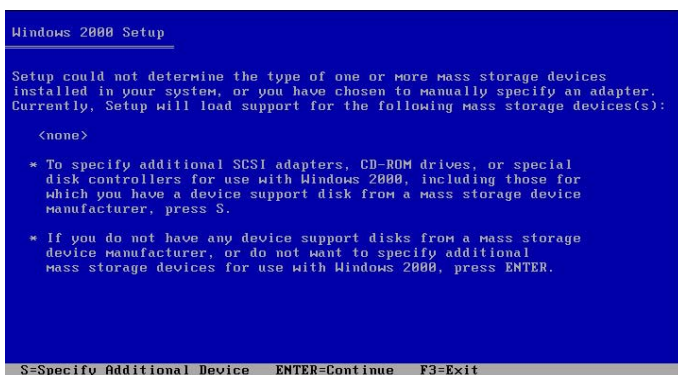
#### During Windows® 2003 Server OS installation

To install the RAID controller driver when installing Windows® 2000/2003 Server OS:

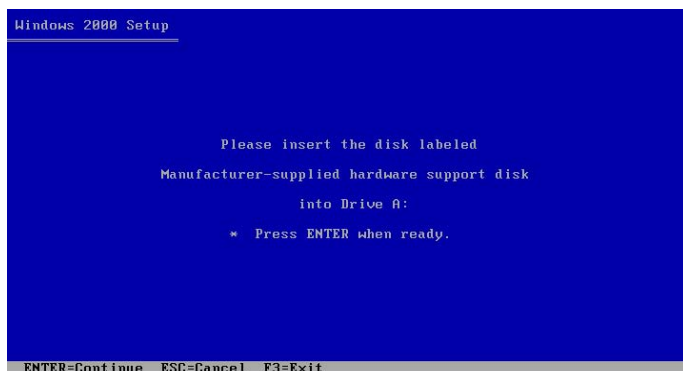
1. Boot the computer using the Windows® 2003 Server installation CD. The **Windows® 2003 Setup** starts.



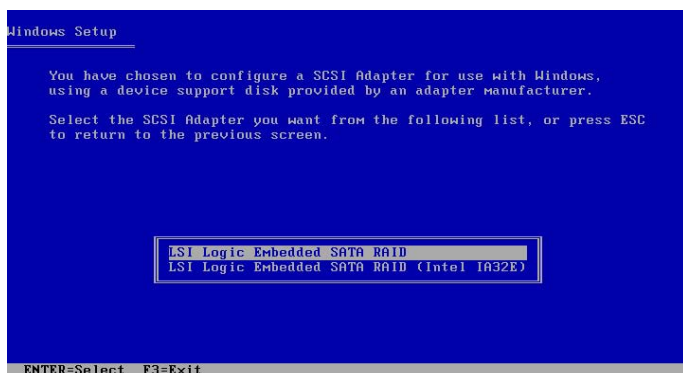
2. Press <F6> when the message “**Press F6 if you need to install a third party SCSI or RAID driver...**” appears at the bottom of the screen.
3. When prompted, press <S> to specify an additional device.



4. Insert the RAID driver disk you created earlier to the floppy disk drive, then press <Enter>.



5. Select the RAID controller driver from the list, then press <Enter>.



## LSI Logic SATA RAID

Select **"LSI Logic Embedded SATA RAID"** for 32bit Windows 2003 Server OS from the list, then press <Enter>. For 64bit Windows 2003 Server OS, please select **"LSI Logic Embedded SATA RAID ( Intel IA32E )"** item.



## Intel Matrix Storage

Select **“Intel(R) 82801GR/GH SATA RAID Controller (Desktop ICH7RDH)”** for Intel Matrix Storage RAID mode from the list, then press <Enter>.

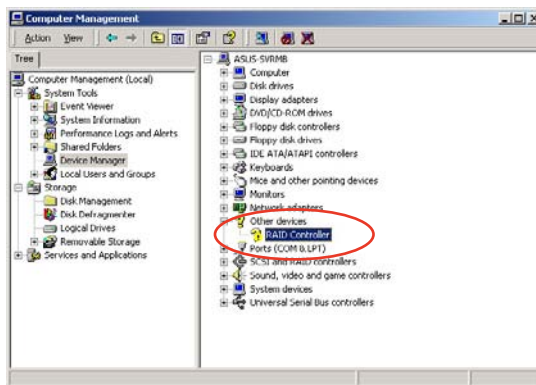
If you configured SATA as AHCI Mode in the BIOS setup utility of IDE Configuration, first install the **Intel SATA AHCI Driver** during windows setup. Then, select the **“Intel(R) 82801GR/GH SATA AHCI Controller (Desktop ICH7RDH)”** from the list. Refer to section “6.1.1 Creating a RAID driver disk” to create the Intel SATA Driver for windows system.

6. The Windows® 2003 Setup loads the RAID controller drivers from the RAID driver disk. When prompted, press <Enter> to continue installation.
7. Setup then proceeds with the OS installation. Follow screen instructions to continue.

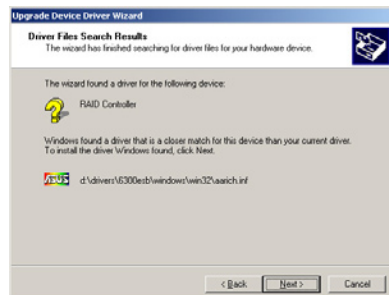
## To an existing Windows® 2003 Server OS

To install the RAID controller driver on an existing Windows® 2003 Server OS:

1. Restart the computer, then log in with **Administrator** privileges.
2. Windows® automatically detects the RAID controller and displays a **New Hardware Found** window. Click **Cancel**.
3. Right-click the **My Computer** icon on the Windows® desktop , then select **Properties** from the menu.
4. Click the **Hardware** tab then click the **Device Manager** button to display the list of devices installed in the system.



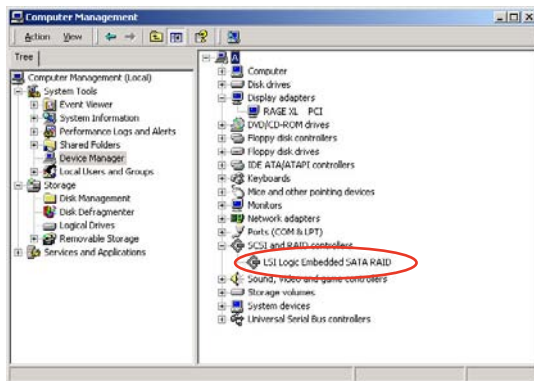
5. Right-click the **RAID controller** item, then select **Properties**.
6. Click the **Driver** tab, then click the **Update Driver** button.
7. The **Upgrade Device Driver Wizard** window appears. Click **Next**.
8. Insert the RAID driver disk you created earlier to the floppy disk drive.
9. Select the option **"Search for a suitable driver for my device (recommended)"**, then click Next.
10. The wizard searches the RAID controller drivers. When found, click **Next** to install the drivers.
11. Click **Finish** after the driver installation is done.





To verify the RAID controller driver installation:

1. Right-click the **My Computer** icon on the Windows® desktop , then select **Properties** from the menu.
2. Click the **Hardware** tab, then click the **Device Manager** button.
3. Click the “+” sign before the item **SCSI and RAID controllers**. The **LSI Logic Embedded SATA RAID** or **Intel® 8201 GR/GH SATA RAID** items should appear.



4. Right-click the **RAID controller driver** item, then select **Properties** from the menu.
5. Click the **Driver** tab, then click the **Driver Details** button to display the RAID controller drivers.
6. Click **OK** when finished.

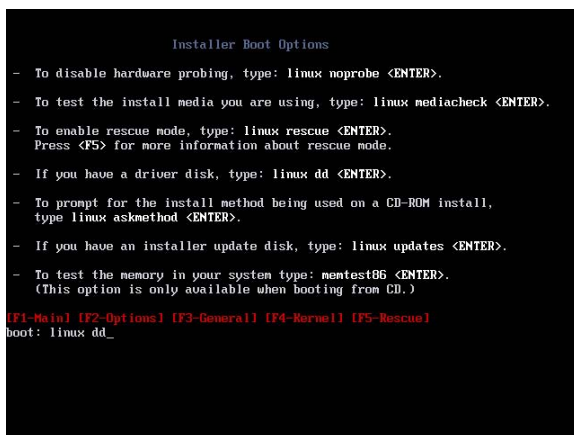
## Red Hat® Enterprise ver. 3.0

To install the Intel® ICH7R LSI Logic Embedded SATA RAID controller driver when installing Red Hat® Enterprise ver. 3.0 operating system:

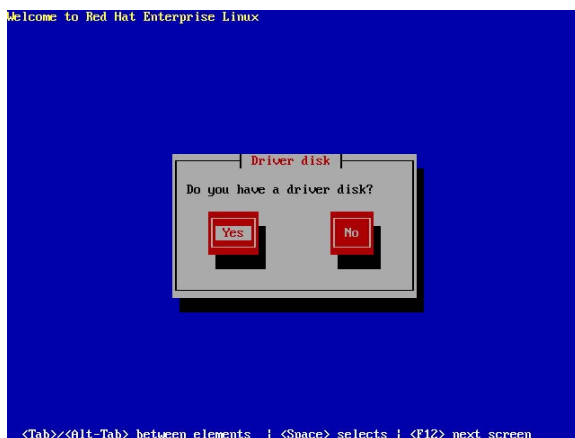
1. Boot the system from the Red Hat® Installation CD.



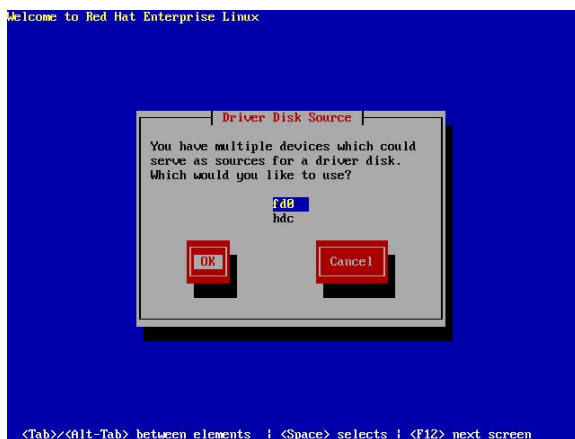
2. At the boot:, type `linux dd` , then press <Enter>.



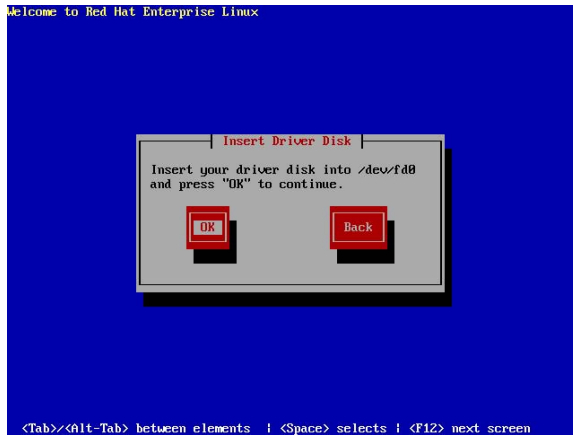
3. Select **Yes** using the <Tab> key when asked if you have the driver disk. Press <Enter>



4. Select **fd0** using the <Tab> key when asked to select the driver disk source. Press <Tab> to move the cursor to **OK**, then press <Enter>.

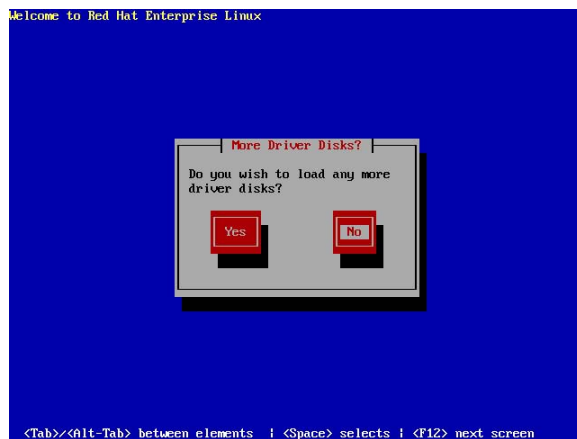


- When prompted, insert the Red Hat® Enterprise ver. 3.0 RAID driver disk to the floppy disk drive, select **OK**, then press <Enter>.



The drivers for the RAID controller are installed to the system.

- When asked if you will load additional RAID controller drivers, select **Yes**, then install the additional RAID controller drivers.

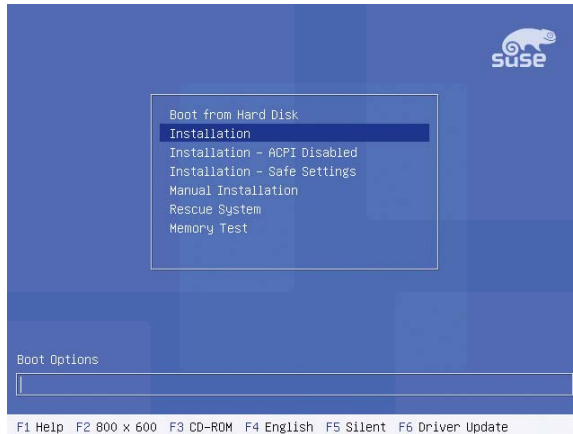


- Follow screen instructions to continue the OS installation.

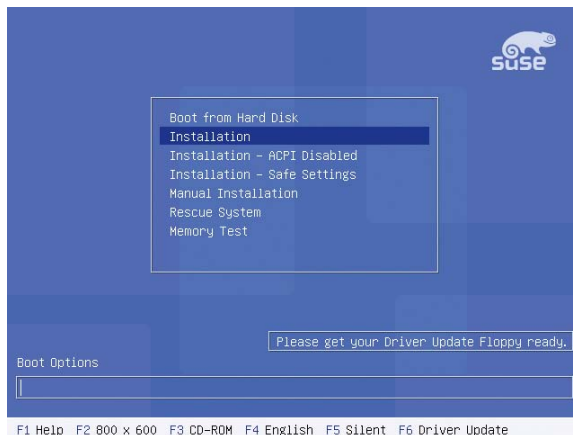
## SuSE Linux

To install the RAID controller driver when installing SuSE Linux OS:

1. Boot the system from the SuSE Installation CD.
2. Select **Installation** from the **Boot Options** menu, then press <Enter>.

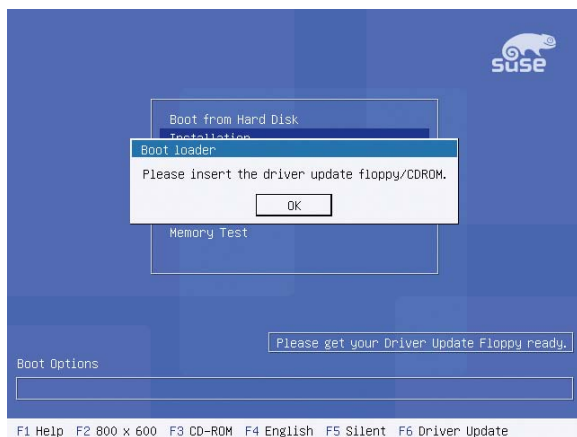


3. A message instructs you to prepare the RAID driver disk. Press <F6>.

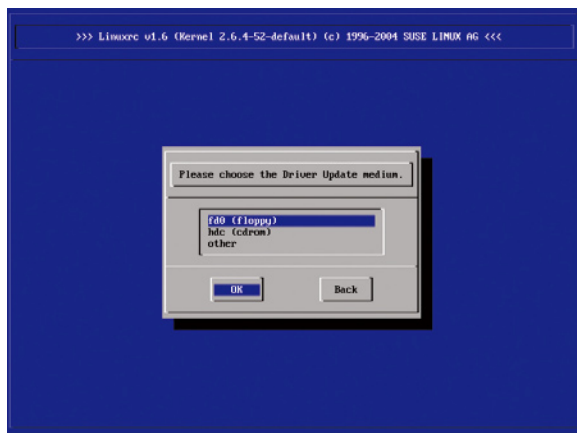


For SuSE Linux Enterprise Server 9.0 SP1 operating system, do not use OS bundled driver, otherwise your computer may become unstable due to OS limitation.

- When prompted, insert the RAID driver disk to the floppy disk drive, then press <Enter>.



- When prompted, select the floppy disk drive (fd0) as the driver update medium, select **OK**, then press <Enter>.



The drivers for the RAID controller are installed to the system.

## 6.2 LAN driver installation

This section provides instructions on how to install the Broadcom® Gigabit LAN controller drivers.

### 6.2.1 Windows® 2003 Server

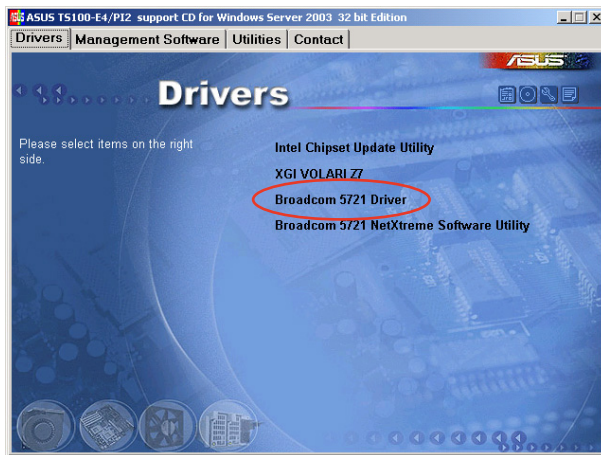
To install the Broadcom® Gigabit LAN controller driver on a Windows® 2003 Server OS:

1. Restart the computer, then log on with **Administrator** privileges.
2. Insert the motherboard/system support CD to the optical drive. The CD automatically displays the **Drivers** menu if Autorun is enabled in your computer.

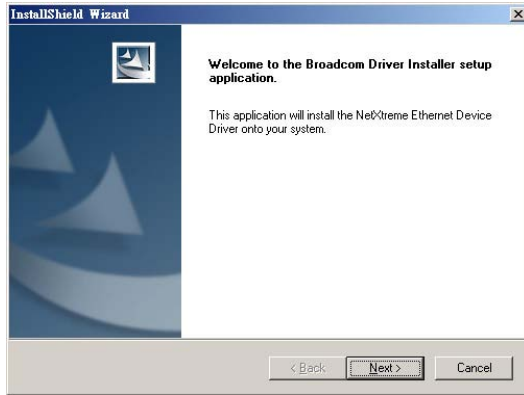


- Windows® automatically detects the LAN controllers and displays a **New Hardware Found** window. Click **Cancel** to close this window.
- If Autorun is NOT enabled in your computer, browse the contents of the support CD to locate the file **ASSETUP.EXE** from the **BIN** folder. Double-click the **ASSETUP.EXE** to run the CD.

3. Click the **Broadcom 5721 Driver** option to begin installation.



4. Click **Next** when the InstallShield Wizard window appears. Follow screen instructions to continue installation.



## 6.2.2 Red Hat® Enterprise ver. 3.0

Follow these instructions when installing the Broadcom® Gigabit LAN controller base driver for the Red Hat® Enterprise ver. 3.0 operating system.

### Building the driver from the TAR file



---

Install first the Kernel Development tools before building the driver from the TAR file.

---

To build the driver from the TAR file:

1. Create a directory and extract the TAR files:  
`tar xvzf bcm5700-<version>.tar.gz`
2. Build the driver bcm5700.o as a loadable module for the running kernel:  
`cd bcm5700-<version>/src`  
`make`
3. Test the driver by loading it:  
`insmod bcm5700.o`
4. Install the driver and man page:  
`make install`
5. Refer to Red Hat distribution documentation to configure the network protocol and address.



## **6.3 VGA driver installation**

This section provides instructions on how to install the XGI Graphics driver.

### **6.3.1 Windows® 2003 Server**

The Windows® 2003 Server operating system automatically recognizes the XGI Graphics driver during system installation. There is no need to install an additional driver(s) to support the onboard VGA.

### **6.3.2 Red Hat® Enterprise ver. 3.0**

The Red Hat® Enterprise ver. 3.0 operating system automatically recognizes the XGI Graphics driver during system installation. There is no need to install an additional driver(s) to support the onboard VGA.

## 6.4 Management applications and utilities installation

The support CD that came with the motherboard package contains the drivers, management applications, and utilities that you can install to avail all motherboard features.



The contents of the support CD are subject to change at any time without notice. Visit the ASUS website ([www.asus.com](http://www.asus.com)) for updates.

### 6.4.1 Running the support CD

Place the support CD to the optical drive. The CD automatically displays the Drivers menu if Autorun is enabled in your computer.



If Autorun is NOT enabled in your computer, browse the contents of the support CD to locate the file **ASSETUP.EXE** from the BIN folder. Double-click the **ASSETUP.EXE** to run the CD.

### 6.4.2 Drivers menu

The Drivers menu shows the available device drivers if the system detects installed devices. Install the necessary drivers to activate the devices.



The screen display and driver options vary under different operating system versions.



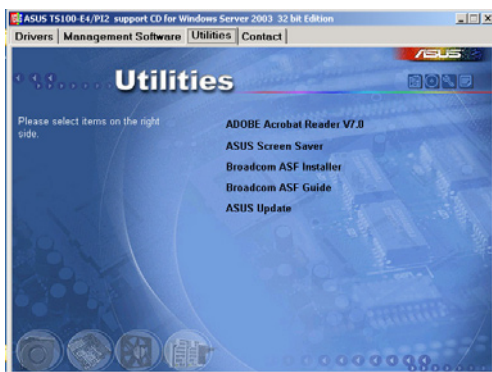
### 6.4.3 Management Software menu

The **Management Software** menu displays the available network and server monitoring application. Click on an item to install.



### 6.4.4 Utilities menu

The **Utilities** menu displays the software applications



### 6.4.5 Contact information

Click the **Contact** tab to display the ASUS contact



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# Appendix

The Appendix describes the CPU features that the motherboard supports.



# Reference Info

## A.1 Intel® EM64T



- The motherboard is fully compatible with Intel® Pentium® 4 LGA775 processors running on 32-bit operating systems.
- The motherboard comes with a BIOS file that supports EM64T. You can download the latest BIOS file from the ASUS website ([www.asus.com/support/download/](http://www.asus.com/support/download/)) if you need to update the BIOS file. See Chapter 5 for details.
- Visit [www.intel.com](http://www.intel.com) for more information on the EM64T feature.
- Visit [www.microsoft.com](http://www.microsoft.com) for more information on Windows® 64-bit OS.

### Using the Intel® EM64T feature

To use the Intel® EM64T feature:

1. Install an Intel® Pentium® 4 CPU that supports the Intel® EM64T.
2. Install a 64-bit operating system (Windows® XP Professional x64 Edition).
3. Install the 64-bit drivers for the motherboard components and devices from the support CD.
4. Install the 64-bit drivers for expansion cards or add-on devices, if any.



Refer to the expansion card or add-on device(s) documentation, or visit the related website, to verify if the card/device supports a 64-bit system.

## A.2 Enhanced Intel SpeedStep® Technology (EIST)



- The motherboard comes with a BIOS file that supports EIST. You can download the latest BIOS file from the ASUS website ([www.asus.com/support/download/](http://www.asus.com/support/download/)) if you need to update the BIOS. See Chapter 5 for details.
- Visit [www.intel.com](http://www.intel.com) for more information on the EIST feature.

### A.2.1 System requirements

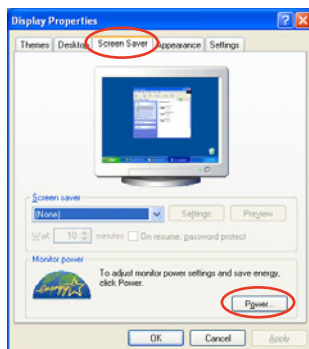
Before using EIST, check your system if it meets the following requirements:


- Intel® Pentium® 4 processor with EIST support
- BIOS file with EIST support
- Operating system with EIST support (Windows® XP SP2/Linux 2.6 kernel or later versions)

## A.2.2 Using the EIST

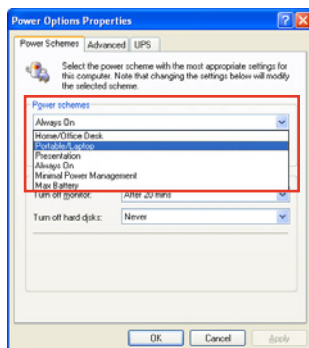
To use the EIST feature:

1. Turn on the computer, then enter the BIOS Setup.
2. Go to the Advanced Menu, highlight CPU Configuration, then press <Enter>.
3. Set the Intel(R) SpeedStep Technology item to [Automatic], then press <Enter>. See page 5-24 for details.
4. Press <F10> to save your changes and exit the BIOS setup.
5. After the computer restarts, right click on a blank space on the desktop, then select Properties from the pop-up menu.
6. When the Display Properties window appears, click the Screen Saver tab.
7. Click the Power button on the Monitor power section to open the Power Options Properties window.



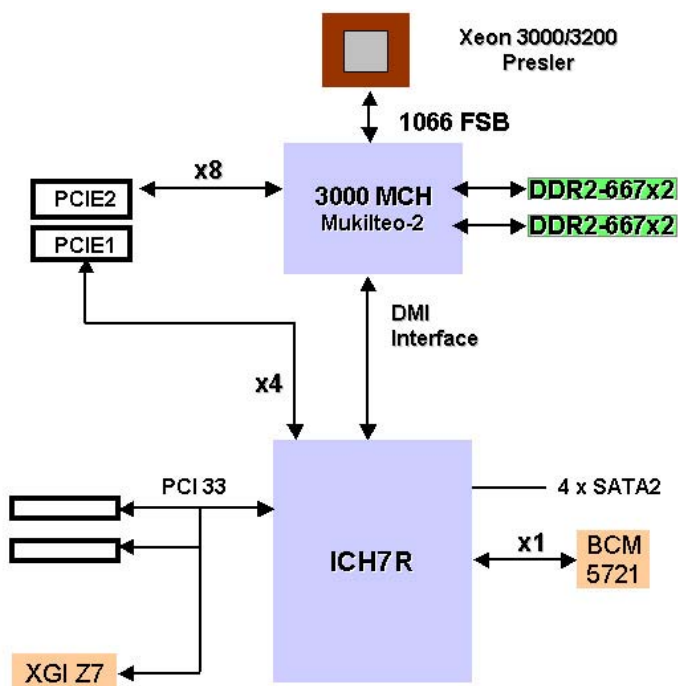
8. On the Power schemes section, click , then select any option except Home/Office Desktop or Always On.
9. Click Apply, then click OK.
10. Close the Display Properties window.

After you adjust the power scheme, the CPU internal frequency slightly decreases when the CPU loading is low.



The screen displays and procedures may vary depending on the operating system.

## A.3 Block diagram

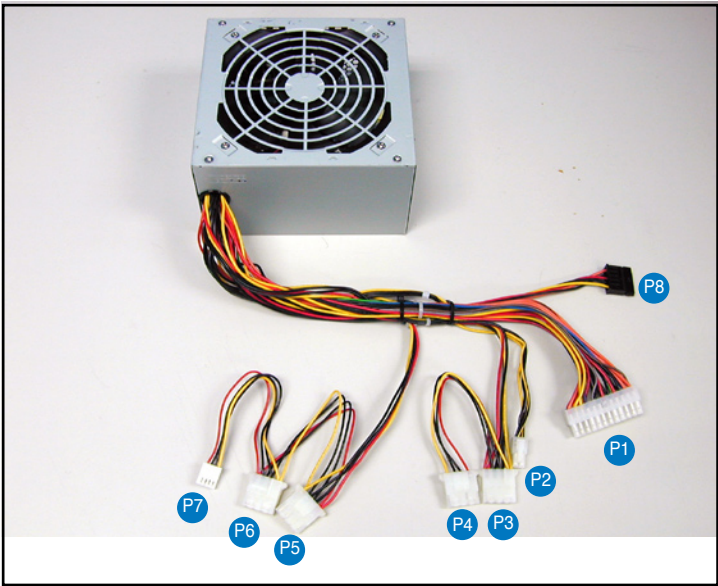




# A.4 670 W single power supply

## A.4.1 General description

The 250W single power supply with ATX-compliant output cables and connectors. The power supply has 8 plugs labeled P1 to P8. Take note of the devices to which you should connect the plugs.



P1	Motherboard 24-pin ATX power connector
P2	Motherboard 4-pin +12V power connector
P3	Peripheral device (available);Optical drive
P4	Peripheral device (available);Optical drive
P5	Peripheral device (available);HDD
P6	Peripheral device (available);HDD
P7	Floppy disk drive
P8	SATA power connector



The voltage switch selection must be the same with voltage of AC Power. Fail to do it will cause PSU damage.

# A.4.2 Specifications

## Input Characteristics

- Input Voltage Range  
115V~/6A or 230V~/3A, (By Voltage Switch selection)
- Input Frequency Range  
50 Hz to 60 Hz

## DC Output characteristics

Output Voltage	Max (A)
+3.3V	16A
+5V	18A
+12V1	10A
+12V2	14A
-12V	0.3A
+5VSB	2.5A

- +5V&3.3V Max 115W
- +12V1&+12V2 Max 235W
- Total Conbine Current on 12V1&+12V2 rails are 19A Max